KALMIOPSIS

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EDITORIAL

I know, I know, it's late. There are several reasons for this, but let's just chalk it up to this being my rookie season. I am already working on the next issue so it won't be so late this year. I've had a lot of help on this issue, principally from Dr. Frank Lang, the previous and founding editor of Kalmiopsis. He always answered my many phone calls and graciously helped me decide what to do about this or that. Thank you, Frank. The assistant editors have been most helpful as well. I also had an associate, Jennifer Beigel, who handled all the advertising, helped put together the Rough and Ready article, did proofreading, and performed verious other tasks.

About this issue: The older I get, the more I become interested in history. Dr. Wagner's history of the herbarium is a needed, and fascinating story. I plan to continue carrying historical articles. The Penstemon key is a departure. A lot of work went into it, so I hope it will be useful to you. I've placed the key in the center so it can be removed and used separately. I must thank Dick Straw, noted Penstemon expert, for his criticism.

To all writers and readers: thank you for your patience.

THE COVER

New species Kalmiopsis "fragrans" proposed by Bob Meinke, assistant professor of botany at OSU and program leader for ODA Plant Conservation Biology, and Tom Kaye, (see below). Gary Fredricks photograph.

ABOUT THE AUTHORS

Darren Borgias, Nature Conservancy Stewardship Ecologist, Ashland.

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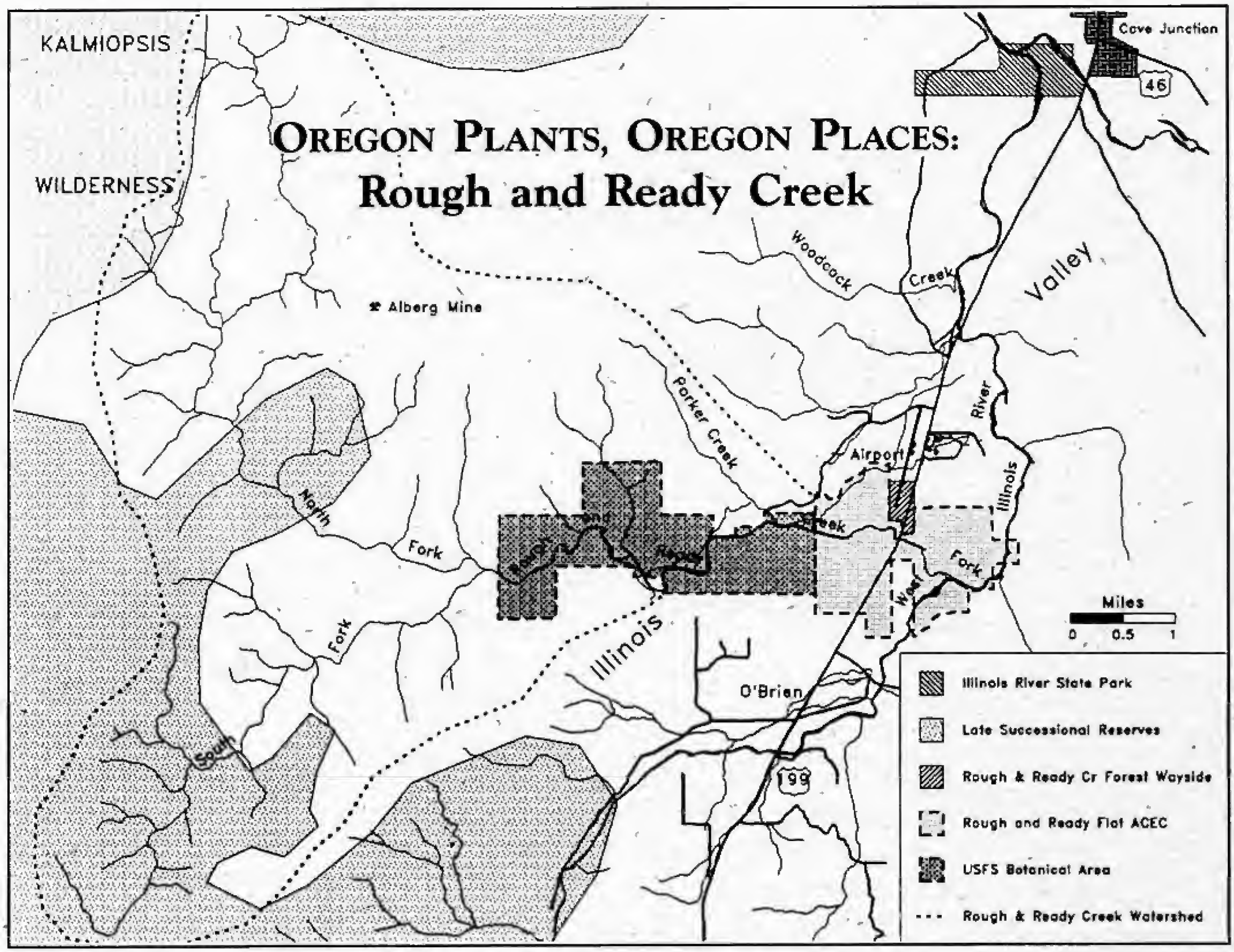
Tom Kaye, Botanist, ODA, and associate OSU Herbarium, Corvallis.

Robin Lodewick, with husband Ken wrote "Penstemon Field Identifier" and "Penstemon Nomenclature" for American Penstemon Society.

David Wagner, Senior Scientist, Northwest Botanical Institute, Eugene.

Oregon Plants, Oregon Places:
Rough and Ready Creek



By DARREN BORGIAS Species list compiled by BARBARA ULLIAN

Crossing Rough and Ready Creek on Highway 199 south of Cave Junction, one might be struck by the irony of the little sign proclaiming a botanical wayside in the strangely bleak terrain. Appearing impoverished or burned over, with tortured looking trees, the observer resists the idea that the site is actually a thriving ecosystem. But native plant enthusiasts who have visited the site recognize it as a special place. Once on foot, even a casual observer will be impressed by the rich and intriguing assemblage of wildflowers. Some are rare endemics not found outside the Illinois Valley. The complementary colors and shapes of flowers and herbage between the rounded cobbles, offer aesthetic treats that diminish only with the departure of spring. Moving down to the water and up the canyon the hiker can extend the experience through the growing season. The broad alluvial bench beside Rough and Ready Creek is one of Oregon's gems. It is the only significant example of a serpentine ecosystem on the floor of the western interior valley province of Oregon (ONHP 1993).

ULLIAN

Alluvial Terrace: Jeffrey Pine and Ceanothus

The biological wealth of the Rough and Ready Creek watershed, a tributary of the Illinois River, is tied to the geologic history of the Klamath Range. This region and the specific subrange, the Siskiyou Mountains, is one of the great reservoirs of biological diversity in North America (Whittaker 1961). In his classic *The Klamath Knot,* David Rains Wallace aptly calls it "a venerable unity." The region is a crossroads in time and space where plant species have converged in unique combinations. It is also an important center of endemic species of vascular plants (Smith and Sawyer 1988, Whittaker 1961). Relict species, lost from the adjoining regions, found refuge in the Siskiyous over a period of 40 million years. Throughout its history, the range provided geographic variation in climate and topography to meet the varied ecological tolerances of species lost elsewhere due to submergence, desiccation, and massive flows of lava or ice. The range has also bridged the evolving floras of the Great Basin and northern California and, for over 10 million years, the emergent Coast Range and Cascade Mountains.

Local speciation contributed a host of narrow endemics, adding to the celebrated species' richness. Many rare plant species of southern Oregon owe their origin to the selective pressures exerted by serpentine soils (Kruckeberg 1969). Massive sheets of ultramafic rock — generally referred to as serpentine — are one of the salient features of the range. The red, rocky soils derived from the parent material are high in magnesium and heavy metals, and are calcium-deficient. Some serpentine endemics are only found on the red ultramafic soils, while many regionally common species find the soils intolerable. The structure and composition of the communities offer a distinct and unique ecosystem that stands out abruptly from the non-serpentine matrix (Whittaker 1954).

The tectonic processes that formed the mountains and engendered these biological treasures, also made rich deposits of minerals. Gold, precipitated in hydrothermal vents on the ocean floor, was uplifted in the Klamaths (Orr et al 1992). Natural erosion and stream hydraulics concentrated large placer gold deposits in the rivers and streams. By 1853, miners from the California gold fields began working the beds of the Illinois River and its tributaries (Shennon 1933, Street and Street 1973). For eighty years, first with shovels and later with 6" diameter hydraulic cannons, called "giants," miners washed the floodplains and higher benches of streams into their muddy sluices. Rough and Ready Creek offered negligible gold, and was spared.

ULLIAN

Forbs on the alluvial terrace

Tumbling clear and cold out of the Siskiyous, Rough and Ready Creek rears cutthroat trout and winter steelhead in the unclogged gravels (USFS 1988). Below, a five mile stretch on the valley floor bears the freely braided channels of the stream. On the broad alluvial terrace above the present floodplain, the cobbly surface still displays the scars of torrential flooding released from local glaciers that once plucked boulders from the creek's headwaters during the Pleistocene Epoch (Shennon 1933).

The climate of the Rough and Ready Creek watershed varies due to wide elevational range and physiography. Maritime influences reach the peaks of the watershed at the crest of the western Siskiyou Mountains, but dissipate over the interior valley which is relatively xeric. Annual precipitation may range from 600 to 1700 mm (Franklin and Dyrness 1988). Temperatures, relative to the Cascades, are warm and wet in the winter and hot and dry in the summer.

The combined effects of varied serpentine influence, soil texture, drainage, and fire history, along with a variation in precipitation due to elevation, have generated a fascinating array of communities in the watershed and on the alluvial terrace. Rare and sensitive plants are found throughout the watershed but are concentrated along the stream corridor and on the broad alluvial terrace.

ULLIAN

Floodplain at high water

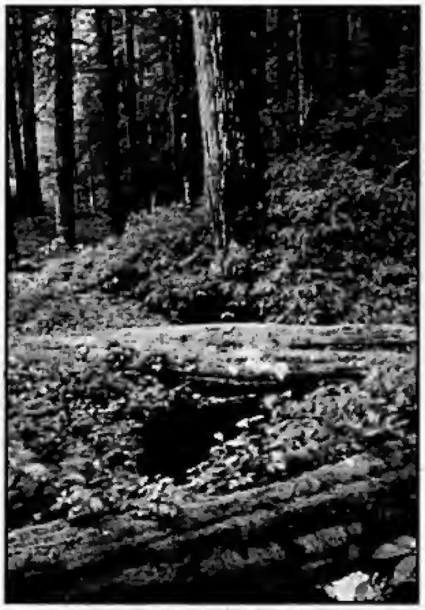
The stream is mostly unimpeded, with its floodplain system and processes largely intact. Recently deposited lenses and beds of sorted gravels nearest the shifting creek are colonized by species carried down by the stream from the highest ridges. Two species of rock cress *(Arabis modesta* and *A. koehleri* var. *stipitata)*, ternate buckwheat *(Eriogonum ternatum)*, and Siskiyou Mountain pennycress *(Thlaspi montanum* var. *siskiyouense)* create low miniature islands of matted vegetation. These assemble with the expected low elevation species of brodiaea, onion, and violets between glaucus, blue bunches of Idaho fescue *(Festuca idahoensis)* and Lemmon's needlegrass *(Stipa lemmonii)*. Along the banks a rare willow *(Salix delnortensis)* is common.

The terrace above the riverwash supports chaparral dominated by manzanita *(Arctostaphylos viscida* and *A. canescens)* or wedgeleaf ceanothus *(Ceanothus cuneatus)*. A hybrid swarm of crosses and back crosses between the *Arctostaphylos* species has been documented in the area (Gottlieb 1968). This occurs on and around non-serpentine "islands" on the terrace, and may represent the differentiation of a new species. A similar hybrid swarm between *Ceanothus cuneatus* and *C. pumilus* has also been documented in the area (Nobs 1963). A palette of colorful species lights up the terrace, including the small, strident purple blooms of Douglas' monkeyflower *(Mimulus douglasii)* together with yellow and white buckwheats, red and pink paintbrushes, blue penstemon, and purple brodiaea, among others.

A number of different types of Jeffrey pine woodlands occur on serpentine outcrops in southwestern Oregon (Atzet 1983, White 1971), and all but one can be found in the Rough and Ready watershed. In the simplest terms, much of the terrace and the slopes of the canyon support Jeffrey pine savanna with its native perennial bunchgrass understory. The serpentine soils and intact native grass community have precluded invasion by introduced annual grasses that plague other grasslands in the West. It is on serpentine that one can glimpse what the grasslands of southern Oregon looked like at the time of settlement. The largest known population of Siskiyou fritillary *(Fritillaria glauca)* occurs here along with Howell's fawn lily *(Erythronium howellii)*. In mid-summer, three rare composites, silky balsamroot *(Balsamorhiza sericea)*, Howell's microseris *(Microseris howellii)* and Western senecio *(Senecio hesperius)* bloom with Howell's mariposa lily *(Calochortus howellii)*.

Loamier soils and sites with greater moisture availability support a unique mixed conifer community with the chaparral shrubs added, along with huckleberry oak *(Quercus vaccinifolia)* and Brewer's oak *(Quercus garryana* var. *breweri)* among others. South of the creek on the alluvial terrace, an early successional forest of knobcone pine *(Pinus attenuata)* dominates areas that have burned recently.

Two rare communities occur at the highest elevations on the gently sloped ancient peneplain. On spring-moistened granitic outcrops, Western hemlock *(Tsuga heterophylla)* with Port Orford cedar *(Chamaecyperis lawsoniana)* occur as eastern extensions of a coastal type. On dry sites a hemlock forest with Sadler's oak *(Quercus sadleriana)* is also a rarity. Rough and Ready Lakes, glacial tarns at the head of the North Fork are surrounded by Western white pine *(Pinus monticola)* forest. Isolated springs and seeps along the lower slopes support serpentine hanging fens with their unique flora characterized by the insectivorous pitcher plant *(Darlingtonia californica)*. In one fen is found a population of *Hastingsia bracteosa* var. *atropurpurea* (large flowered rush lily) the southernmost documented sighting of the species.



ULLIAN

Port Orford Cedar and Hemlock forest

Site Conservation

As information about Rough and Ready Creek has been gained, its importance has been recognized by the agencies that manage the watershed. The impetus to protect the site began in 1937 with the Illinois Valley Garden Club led by Effie Smith. Smith, a woman who once called Mrs. Henry Ford to ask that the local dealer remove a billboard at the entrance to the valley, convinced the state to create the Rough and Ready Creek State Park. Succumbing to the pressures of development, the original 99-acre park was whittled down over time to the 11-acre botanical wayside that remains beside Highway 199. Expansion plans and new developments threaten to carve further into this park remnant and impact the larger Rough and Ready Creek watershed. Fortunately, recent federal designations have helped highlight the biological importance of the site.

ULLIAN

Rough and Ready Lakes overlook

Two federal agencies manage most of the 23,000-acre watershed. The Siskiyou National Forest has designated a Botanical Area extending over 1,500 acres at the mouth of the creek's canyon. After careful analysis, Forest Service staff found the stream eligible for designation as wild and scenic. The 2,000-acre North Fork headwaters lies within the boundary of the Kalmiopsis Wilderness, and most of the watershed is within the South Kalmiopsis Roadless Area. Additionally, some of the land is included in Late Successional Reserves designed to maintain habitat for the northern spotted owl. The Bureau of Land Management has designated a 1,162-acre Area of Critical Environmental Concern (ACEC). The ACEC covers the lower portions of the stream and terrace and wraps around the State Park Botanical Wayside, managed by the Oregon Parks and Recreation Department, linking protective status with the Forest Service Botanical Area.

Complementing the designations provided by the federal agencies is the protection work of the private non-profit corporation, The Nature Conservancy of Oregon. The Conservancy holds the protection of Rough and Ready Creek as one of its top priorities statewide, and has begun to acquire small private holdings on the floodplain and terrace. Support for protection efforts has been given by the Siskiyou Regional Education Project (SREP), a local environmental group. SREP drafted the nomination for the BLM ACEC. They have worked to stop development in the watershed, organized wildflower walks, and compiled the species list that follows.

Despite growing recognition for the area, impacts from planned development could negate protected status of the lands and erode the integrity of the watershed and its natural systems. Over 4,000 acres in the core of the watershed are covered by mining claims. Nickel deposits could be mined using open pits, and extensive roads and stream crossings would have to be developed. Downstream, local officials have drawn up plans for an expanded airport and industrial park in the area proposed for the ACEC. Finally, withdrawal of water at three diversions currently reduces summer flows in the lower stretches of the creek and could be critical to the stream ecology.

Bringing all the stakeholders at Rough and Ready to the table, including conservation groups such as the Native Plant Society of Oregon, will help to encourage creative solutions that will preserve this biologically rich and intriguing site for future generations of Oregonians. This description of the site and the plant species list are offered to encourage additional biological investigation of the Rough and Ready Creek watershed and to support conservation planning there.

Directions:

Access to the Rough and Ready State Botanical Wayside and BLM Area of Critical Environmental Concern is found 4.5 miles south of Cave Junction on Hwy. 199. The Wayside, identified by a small sign, lies on the west side of the road just before the bridge over Rough and Ready Creek. Parking space is provided at the dirt turn out. There are no other facilities at the Wayside. The ACEC lies on both sides of the highway and both sides of Rough and Ready Creek. The National Forest Botanical Area is contiguous with the west boundary of the ACEC, less than a mile from the Wayside parking. To reach the headwaters of Rough and Ready Creek first stop at the USFS office in Cave Junction to get a map and to consult on whether access has been limited to protect Port Orford cedar in the watersheds from the root pathogen *Phytopthora lateralis.*

Species List

This preliminary list was compiled from a number of sources. The nomenclature for this list follows Hickman (1993) and Peck (1961). Corrections, additions and suggestions to this list may be sent to Frank Lang, Department of Biology, Southern Oregon State College, Ashland, Oregon 97520.

TREES

Alnus rubra (red alder); *Arbutus menziesii* (Pacific madrone); *Calocedrus decurrens* (incense cedar); *Chamaecyparis lawsoniana* (Port Orford cedar); *Chrysolepsis chrysophylla* var. *chrysophylla* (golden chinquapin); *Pinus attenuata* (knobcone pine); *Pinus contorta* (lodgepole pine); *Pinus jeffreyi* (Jeffrey pine); *Pinus lambertiana* (sugar pine); *Pinus monticola* (Western white pine); *Pseudotsuga menziesii* (Douglas fir); *Taxus brevifolia* (Pacific yew); *Tsuga heterophylla* (Western hemlock); *Lithocarpus densiflorus* (tanoak); *Quercus garryana* (Oregon white oak); *Quercus kelloggii* (California black oak).

SHRUBS

Amelanchier spp. (serviceberry); *Arctostaphylos canescens* (white oak-manzanita); *Arctostaphylos hispidula* (Howell's manzanita); *Arctostaphylos nevadensis* (pinemat manzanita); *Arctostaphylos viscida* (whiteleaf manzanita); *Berberis aquifolium* (tall Oregon grape); *B. aquifolium* var. *repens* [*Berberis pumila*] (pygmy Oregon grape); *Berberis nervosa* (long-leaved Oregon grape); *Ceanothus cuneatus* (wedgeleaf ceanothus); *Ceanothus integerrimus* (deerbrush); *Ceanothus prostratus* (mahala mat); *Ceanothus pumilus* (dwarf ceanothus); *Ceanothus sanguineus* (red stem ceanothus); *Cercocarpus betuloides* (birchleaf mountain-mahogany); *Chrysothamnus nauseosus* var. *albicaulis* (rubber rabbit brush); *Garrya buxifolia* (boxleaf silktassel); *Garrya fremontii* (Fremont's silktassel); *Gaultheria ovatifolia* (slender salal); *Gaultheria shallon* (salal); *Holodiscus discolor* (oceanspray); *Ledum glandulosum* (Labrador tea); *Leucothoe davisiae* (Sierra leucothoe); *Physocarpus capitatus* (Pacific ninebark); *Prunus virginiana* (chokecherry); *Quercus chrysolepsis* (canyon live oak); *Quercus garryana* var. *breweri* (Brewer's oak); *Quercus sadleriana* (Sadler's oak); *Quercus vaccinifolia* (huckleberry oak); *Rhamnus californica* (California coffeeberry); *Rhododendron macrophyllum* (Pacific rhododendron); *Rhododendron occidentale* (Western azalea); *Rubus discolor* (Himalayan blackberry); *Rubus laciniatus* (cut-leaved blackberry); *Rubus ursinus* (California blackberry); *Salix* spp. (willow); *Salix delnortensis* (Del Norte willow); *Salix tracyi* (Tracy's willow); *Spiraea douglasii* (Douglas spirea); *Umbellularia californica* (California bay/laurel); *Vaccinium ovatum* (evergreen huckleberry); *Vaccinium parvifolium* (red huckleberry); *Whipplea modesta* (whipple vine).

HERBS

Achillea millefolium (common yarrow); *Allium amplectens* (narrow-leaved onion); *Allium falcifolium* (sickle-leaved onion); *Amsinckia menziesii* [*A. intermedia*] (fiddleneck); *Antennaria dimorpha* (low everlasting); *Apocynum androsaemifolium* (spreading dogbane); *Arabis aculeolata* (Waldo rock cress); *Arabis breweri* (Brewer's rock cress); *Arabis koehleri* var. *stipitata* (Koehler's stipate rock cress); *Arabis modesta* (modest rock cress); *Arabis oregona* (Oregon rock cress); *Arnica cernua* (serpentine arnica); *Asclepias cordifolia* (heart-leaved milkweed); *Aster* spp.; *Astragalus* spp. (locoweed/milkvetch); *Balsamorhiza deltoidea* (deltoid balsamroot); *Balsamorhiza sericea* (silky balsamroot); *Brodiaea capitata* (common brodiaea); *Brodiaea coronaria* (harvest brodiaea); *Calochortus howellii* (Howell's mariposa lily); *Calochortus tolmiei* (Oregon mariposa lily); *Calochortus uniflorus* (pink star tulip); *Calycadenia truncata* (rosin weed); *Calystegia atriplicifolia* (Oregon morning glory); *Camassia howellii* (Howell's camas); *Camassia quamash* (common camas); *Campanula prenanthoides* (California bluebell); *Centaurea solstitialis* (yellow star thistle); *Cardamine gemmata* (purple toothwort); *Cardamine oligosperma* (western bittercress); *Castilleja miniata* ssp. *elata* [*Castilleja elata*] (slender paintbrush); *Castilleja pruinosa* (frosty paintbrush); *Cerastium arvense* (field chickweed); *Chaenactis douglasii* (dusty maiden); *Chlorogalum pomeridianum* (soap plant); *Cirsium* spp. (purple thistle); *Clarkia* spp.; *Claytonia exigua; Claytonia parviflora; Collinsia grandiflora* (giant blue-eyed Mary); *Collinsia rattanii* (Rattan's collinsia); *Convolvulus* spp. (morning glory); *Crocidium multicaule* (spring gold); *Cuscuta occidentalis* (Western dodder); *Cypripedium californicum* (California lady slipper); *Darlingtonia californica* (California pitcher plant); *Delphinium* spp. (larkspur); *Delphinium decorum* (low larkspur); *Dicentra formosa* [ssp. *oregana*] (Oregon bleeding heart); *Dichelostemma multiflora* (many-flowered brodiaea); *Dichelostemma capitatum* [*Brodiaea pulchella*] (blue dicks); *Disporum hookeri* [var. *oreganum*] (Oregon fairybell); *Dodecatheon pulchellum* [ssp. *monanthum*] (Western shooting star); *Dodecatheon hendersonii* (Henderson's shooting star); *Downingia elegans* (elegant downingia); *Draba verna* (spring Whitlow grass); *Epilobium minutum* (willow-herb); *Epilobium rigidum* (rigid willow-herb); *Epilobium brachycarpum* (parched fireweed); *Epipactis gigantea* (stream orchid); *Erodium* spp. (storksbill); *Erigeron bloomeri* var. *bloomeri* [var. *pubescens*] (rayless aster); *Eriodictyon californicum* (yerba santa); *Eriogonum diclinum* (Jayne's Canyon buckwheat); *Eriogonum nudum* (barestem buckwheat); *Eriogonum pendulum* (Waldo eriogonum); *Eriogonum spergulinum* (hair-stemmed eriogonum); *Eriogonum ternatum* (ternate eriogonum); *Eriogonum umbellatum* (sulphur buckwheat); *Eriophyllum lanatum* (woolly sunflower); *Erysimum* spp. (wallflower); *Erysimum capitatum* (Western wallflower); *Erythronium citrinum* (lemon fawn lily); *Erythronium howellii* (Howell's fawn lily); *Erythronium oregonum* (giant fawn lily); *Eschscholzia californica* (California poppy); *Eschscholzia caespitosa* (dwarf California poppy); *Euphorbia crenulata* (Chinese caps); *Fritillaria affinis* (mission bells); *Fritillaria atropurpurea* (checker lily); *Fritillaria glauca* (Siskiyou fritillaria); *Galium ambiguum* (obscure bedstraw); *Galium aparine* (bedstraw); *Galium bolanderi* (Bolander's bedstraw); *Gentiana setigera* (elegant gentian); *Gilia capitata* (blue-headed gilia); *Goodyera oblongifolia* (Western rattlesnake plaintain); *Haplopappus* spp.; *Haplopappus racemosus* ssp. *congestus*; *Hastingsia alba* (rush lily); *Hastingsia bracteosa* (large-flowered rush lily); *Helenium* spp. (sneeze weed); *Hesperochiron pumilus* (California hesperochiron); *Hieracium albiflorum* (white-flowered hawkweed); *Hieracium bolanderi* (Bolander's hawkweed); *Hieracium parryi*; *Horkelia* spp.; *Horkelia congesta* ssp. *nemorosa* (Josephine horkelia); *Horkelia sericata* (silky horkelia); *Horkelia tridentata* (three-toothed horkelia); *Hypericum anagalloides* (trailing St. John's wort); *Hypericum perforatum* (common St. John's wort); *Iris bracteata* (Siskiyou Iris); *Lathyrus* spp. (peavine); *Lewisia leana* (Lee's lewisia); *Lewisia oppositifolia* (opposite-leaved lewisia); *Lilium bolanderi* (Bolander's lily); *Limnanthes gracilis* var. *gracilis* (slender meadow foam); *Linanthus bicolor* (two-color baby stars); *Linanthus bolanderi*; *Linnaea borealis* var. *longiflora* (twin flower); *Lithophragma* spp. (fringecup); *Lithophragma heterophyllum* (woodland star); *Lithophragma parviflorum* (small-flowered fringecup); *Lithospermum californicum* (Western puccoon); *Lomatium engelmannii*; *Lomatium macrocarpum* (giant-seeded lomatium); *Lomatium martindalei* (few-fruited desert parsley); *Lomatium nudicaule* (pestle lomatium); *Lomatium tracyi* (Tracy's lomatium); *Lomatium triternatum* (Lewis' lomatium); *Lomatium utriculatum* (fine-leaved desert parsley); *Lonicera hispidula* (hairy honeysuckle); *Lotus* spp. (deervetch); *Lotus oblongifolius* (Torrey's lotus); *Luina* spp. (luina); *Luina nardosmia* (cutleaf luina); *Lupinus albifrons* var. *collinus* [var. *fumineus*]; Lupinus nanus (dwarf lupine); *Lupinus tracyi* (Tracy's lupine); *Madia* spp. (tarweed); *Madia minima*; *Mentzelia laevicaulis* (giant blazing star); *Microseris howellii* (Howell's microseris); *Mimulus douglasii* (Douglas' monkeyflower); *Mimulus guttatus* (yellow monkeyflower); *Minuartia douglasii* [*Arenaria douglasii*] (sandwort); *Minuartia howellii* [*Arenaria howellii*]; *Monardella* spp. (pennyroyal); *Monardella odoratissima* (Pacific monardella); *Monardella purpurea* (Siskiyou monardella); *Montia* spp. (miner's lettuce); *Myosotis* spp. (white forget-me-not); *Narthecium californicum* (California bog asphodel); *Orobanche uniflora* (naked broom-rape); *Orobanche fasciculata* (clustered broom-rape); *Penstemon azureus* (azure penstemon); *Penstemon laetus* (gay penstemon); *Phacelia corymbosa* (phacelia); *Phlox adsurgens* (woodland phlox); *Phlox diffusa* (spreading phlox); *Phlox gracilis* (slender phlox); *Phlox speciosa* (showy phlox); *Pinguicula vulgaris* (butterwort); *Plagiobothrys* spp. (popcorn flower); *Plectritis congesta* (sea blush); *Polygala californica* (California milkwort); *Prunella vulgaris* (selfheal); *Pyrola picta* (white-veined wintergreen); *Ranunculus occidentalis* (Western buttercup); *Rudbeckia californica* (California cone flower); *Sanguisorba microcephala* (burnet); *Sanicula* spp. (sanicle); *Sanicula bipinnatifida* (purple sanicle); *Sanicula peckiana* (Peck's sanicle); *Satureja douglasii* (yerba buena); *Saxifraga oregana* (Oregon saxifrage); *Scutellaria* spp.; *Scutellaria angustifolia* var. *canescens* (narrowleaf skullcap); *Sedum laxum* ssp. *heckneri* (Heckner's sedum); *Senecio canus* (grey senecio); *Senecio hesperius* (Siskiyou butterweed); *Senecio macounii* (Siskiyou Mountains ragwort); *Sidalcea* spp. (checker-mallow); *Sidalcea campestris*; *Sidalcea malvaeflora* spp. *asprella* [ssp. *elegans*] (checkerbloom); *Silene campanulata* (bell catchfly); *Silene hookeri* (Hooker's pink); *Sisyrinchium bellum* (blue-eyed grass); *Sisyrinchium californicum* (golden-eyed grass); *Sisyrinchium douglasii* (grass widow); *Streptanthus howellii* (Howell's streptanthus); *Synthyris reniformis* (snow queen); *Thermopsis* spp. (yellow pea); *Thermopsis macrophylla* (California false lupine); *Thlaspi alpestre* (rock penny cress); *Thlaspi montanum* var. *siskiyouense* (Siskiyou Mt. pennycress); *Tragopogon pratensis* (dwarf salsify); *Trichostema simulatum* (Siskiyou blue-curls); *Triteleia hendersonii* [*Brodiaea hendersonii*] (Henderson's brodiaea); *Triteleia hendersonii* var. *leachiae*; *Trifolium tridentatum* (sand clover); *Trillium ovatum* (white trillium); *Trillium rivale* (brook trillium); *Triteleia hyacinthina* (white hyaçinth); *Verbascum blattaria* (moth mullien); *Viola cuneata* (wedged leaved violet); *Viola hallii* (Hall's violet); *Viola lobata* (pine violet); *Viola orbiculata* (round-leaved violet); *Viola primulifolia* ssp. *occidentalis* (western bog violet); *Wyethia angustifolia* (narrowleaf wyethia); *Xerophyllum tenax* (bear grass); *Zigadenus micranthus* (small-flowered camas); *Zigadenus venenosus* (death çamas).

FERNS

Aspidotis densa (cliff-brake); *Pteridium aquilinum* (Western brackenfern).

GRAMINOIDS

Acnatherum lemmonii [*Stipa lemmonii*] (Lemmon's needlegrass); *Bromus tectorum* (cheatgrass); *Carex* spp. (sedge); *Danthonia californica* (California oatgrass); *Elymus elymoides* [*Sitanion hystrix*] (squirreltail); *Elymus glaucus* (blue wild rye); *Festuca californica* (California fescue); *Festuca idahoensis* (Idaho fescue); *Juncus* spp. (rush); *Koeleria macrantha* (junegrass); *Luzula* spp. (wood rush); *Melica* spp. (melic); *Poa* spp. (bluegrass); *Poa piperi* (Piper's bluegrass).

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Illinois Valley Ranger District: 592-2166
U.S. Bureau of Land Management, Medford: 770-2200
The Nature Conservancy of Oregon, Ashland: 488-4485
Siskiyou Regional Education Project, Cave Junction: 592-4459

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History of the University of Oregon Herbarium (1903-1993)

By DAVID H. WAGNER

Introduction

A herbarium is one of the fundamental resources of traditional botany. Its collections, library, and staff provide a wide range of services to science and society. Most universities older than a hundred years have, or have had, a herbarium because botany was a core science at the time these universities were founded. Just like universities, herbaria have definite founding dates and occasionally dates of closure. This is the story of one of the major west coast herbaria, from beginning to end. Although a herbarium is an institution, the critical elements of the story necessarily concern the people who built and cared for its collections.

Establishment

The University of Oregon Herbarium (known as ORE in the international directory of herbaria) was established in 1903, by Albert Raddin Sweetser (1861-1940). He was a Professor of Botany since 1902 and served as head of the Department of Botany from 1909 until his retirement in 1931. Although he was not an important collector himself, he was very interested in the history of plant exploration. Soon after his arrival in Oregon he made the acquaintance of the resident pioneer botanists of Portland. His first major accomplishment, in 1903, was to secure the donation of the personal collection of Thomas Jefferson Howell (1842-1912). Howell's herbarium consisted of approximately 10,000 sheets. It included nearly 300 type specimens of plants Howell had discovered, as well as duplicates obtained in exchange from other early botanists. At that time it was considered the largest and finest herbarium at any public institution in the northwest. Howell was hired for the 1903-1904 school year to organize the collection.

FROM UO HERBARIUM FILES NOW AT OSU, CORVALLIS

Albert R. Sweetser

The Core of the Collection: The Big Six of Oregon

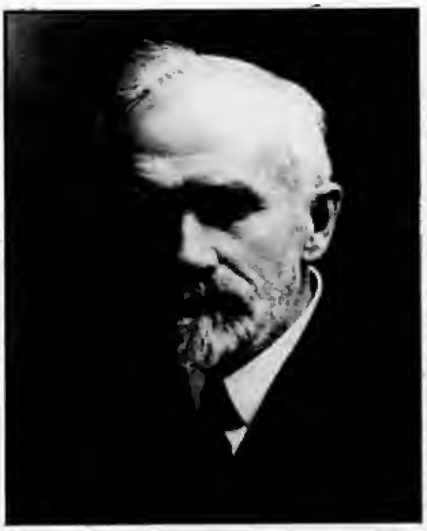
Howell was Oregon's premier resident plant explorer, a self-taught botanist who discovered more new species of plants in the state than any other. He began collecting in the mid-1870's with his older brother, Joseph. They sent their novelties to Asa Gray at Harvard University, who published formal descriptions. He named the genus *Howellia* to honor both brothers. Joseph Howell soon quit botany to work his farm, while Thomas, encouraged by Gray, attempted to make a living as a plant collector. Most major herbaria in the United States harbor at least a few of Howell's specimens, either obtained directly or through bequests of collectors who purchased from him. Because commercial collectors had a good market in Europe, Thomas Howell's specimens are found in many Old World herbaria (most of those in Berlin were probably destroyed by Allied bombing during WWII). He worked all over the state (and also went to Alaska), making the greatest number of his discoveries in the southwestern corner of Oregon. New species brought better prices, so Gray's prompt attention to Oregon collections was extremely important. After Asa Gray died in 1888, Howell, despite only six months' formal schooling, began to publish his own descriptions of new plants. Soon he begain to write the first book on the plants of the Pacific Northwest, ***A Flora of Northwest America.*** It appeared in severn fascicles, the first in March 1987, and the last in August 1903. Upon completion of this work Howell was exhausted and ready to turn over his material to the state university (now known as the University of Oregon).

FROM UO HERBARIUM FILES NOW AT OSU, CORVALLIS

Thomas Jefferson Howell

The next important landmark in the growth of ORE was the purchase of the personal herbarium of William C. Cusick (1842-1922). Cusick worked primarily in eastern Oregon, most notably the Blue Mountains, Wallowa Mountains and Steens Mountain. Although most biographical references give the date of this acquisition as 1913, the 1911 minutes of the Board of Regents note, "a collection of 10,000 sheets was purchased from William C. Cusick." Record of the purchase price and precise delivery date are apparently not preserved in university archives. Cusick, like Howell, was a self-trained frontier botanist cultivated by Asa Gray. Cusick also gathered specimens for sale, resulting in wide distribution of his specimens. European botanists used Cusick's specimens to describe many new names for Pacific Northwest plants. Since the specimens upon which these names are based are housed abroad, the duplicates in Cusick's personal collection are especially valuable. You can examine these locally to get a good sense of what the European botanists had in mind without having to go to the expense and trouble of an international loan. And, as with Howell's herbarium, Cusick's collection contained many valuable sheets he had obtained by exchange including not only those from the better known west coast botanists but also southwestern collections from the likes of H. Rusby and C. Pringle. Most of Cusick's early field notebooks were included in the acquisition and have proven to be an invaluable resource for modern botanists attempting to relocate the rare plants he discovered (in contrast to Howell, who kept poor records; what little remained at his death is rumored to have been destroyed by his grieving wife).

In 1924 the University of Oregon obtained the curatorial services of Louis F. Henderson (1853-1942). Sweetser had acted as curator until then. Sweetser was very broadly trained as a botanist but had very little experience with taxonomy (naming, describing, and classifying plants). He was fascinated by the people who could recognize and give formal Latin names to plants. Henderson was a rare breed. He was a man of scholarly credentials who plunged into the frontier as an explorer. Sweetser's greatest contribution to ORE was to bring in Henderson to care for the herbarium. Henderson's thoughtful curatorial abilities created one of the richest and most useful collections of northwest plants.


FROM UO HERBARIUM FILES NOW AT OSU, CORVALLIS

Louis F. Henderson, Eugene 1920

Henderson came to Portland, Oregon in the early 1880's to teach at and eventually become principal of the Portland High School. In Portland he befriended Thomas Howell. They went on several important collecting expeditions together. Henderson describes these adventures, and many more, in his compelling autobiography (1934?-date uncertain; manuscript on file in the University of Oregon Library's Special Collections[1]). He was well-educated (M.A. in Romance Languages from Cornell, 1874) including good classes in botany. Harships in early life[2] gave him the fortitude to strike out into the wilderness with the fearlessness and self-reliance of a frontiersman. He became the first Professor of Botany at the University of Idaho (herbarium acronym ID), from 1893-1909. That period was marked by the tragic loss of his entire herbarium in a fire in 1906. William H. Baker, one of Henderson's successors at ID, said that 85,000 sheets were consumed (conservation notes, DHW & WHB, 7 Jan 1981).

Henderson's tenure as the first truly professional curator of ORE lasted until 1939. This was a period of rapid growth of the herbarium. Without teaching or other administrative work, Henderson maintained an active collecting program, mounting and arranging in the winters. He encouraged, with occasional personal support, student collectors such as Lincoln Constance (1909-   ) and Roy C. Andrews (1888-1955), and university instructor LeRoy Detling (see below). Most important by far, however, was securing the donation of personal collections of other prominent Northwest botanists. The most significant among these were J.B. Leiberg, M.W. Gorman, and E.P. Sheldon.

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[1] Otherwise unpublished, it was serialized in the NPSO Bulletin sometime during the years 1979-1982.

[2] See Henderson's manuscript "Memories of My Boyhood; Especially Those Related to the Civil War and Reconstruction in the Old South." 1936+; on file in UO Special Collections.

J.W. THOMPSON

Left to right: LeRoy Detling, Louis F. Henderson, Willis Jepson, Marion Owenby; Seattle, Wa., June 1940.

John Bernhard Leiberg (1853-1913) worked for the U.S. Department of Agriculture most of his botanical career, so the first set of his collections are in the National Herbarium (US). The existence of his personal herbarium (particularly the duplication of that at US) is not widely known. It encompasses a large amount of material: his earliest collections from Iowa (1860's!), those he made with Sandberg, Coville, et al. in Washington and Idaho, his California expeditions, and numerous exchange specimens including ones from Howell, Gorman, and Henderson. Perhaps most significant among the latter are Idaho specimens that Henderson had sent to Leiberg when both were working in Idaho at the same time. The isotypes of Henderson's Idaho novelties in the Leiberg herbarium are good candidates for lectotypes of the Henderson holotypes lost in the ID fire of 1906 (only a nomenclaturist will truly relish this situation). Associated with the specimens is Leiberg's personal California notebook, annotated emphatically, "not the property of the USDA!" University records note his collection was received in 1911, but other details of the acquisition of Leiberg's herbarium are not known and have not been researched. He died in Leaburg, on the McKenzie River east of Eugene, over ten years before the start of Henderson's tenure, but it is obvious from annotations that Henderson organized and incorporated the Leiberg material into the collections at ORE.

Martin Woodcock Gorman (1853-1926) was an amateur botanist and gentleman scientist who soon fell in with Howell and Henderson in Portland. He arrived in 1885 to work as an accountant in family businesses. He became one of Howell's sincerest admirers and supporters. Howell's visit to Alaska was arranged by Gorman, who regularly spent summers in Alaska to keep books for his family's canneries. Although Gormon was a well-known and prolific collector of plants (Oregon, Alaska and Washington), independently discovering twenty or more new species, perhaps his most significant contribution to botany was proofreading and editing Howell's ***A Flora of Northwest America***. Without Gorman's meticulous attention, Howell's work would have seemed crude and amateurish, riddled with grammatical errors and misspellings. Although Gorman was assiduous in sending a first set of duplicates to the National Herbarium, he is not well known outside the region because he did not collect for sale. He did, however, vigorously exchange specimens and correspondence with the contemporary local botanists. His voluminous papers and journals are housed in the Special Collections of the University of Oregon Library, waiting to be mined for their meteorological, ethnographical and other natural history observations (cf. Gorman, 1896, *Pittonia* 3(14): 64-85). Again, Henderson was responsible for annotating and incorporating Gorman's mounted sheets into the general collection. However, he merely filed away Gorman's unmounted material, original or not, among his own folders of unmounted duplicates.

Edmund Perry Sheldon (1869-1913 [1917?]) was another of the Portland botanists, friend of Martin Gorman and Louis Henderson. He collected extensively in the Portland area, the Oregon Cascades, the coast, and the Columbia River Gorge. How his collections came to ORE is not known, but it's possible they arrived with those of Gorman, a close friend. Notebooks for the years 1902-1903 ar present at ORE; they include a diary of an expedition to the Three Sisters region with Gorman and others. W.H. Baker recalled Henderson talking about Sheldon visiting him for breakfast at his orchard in Hood River, apparently one of the last times Sheldon was seen alive. Sheldon's end is unknown; Bill Baker relates that the most widely held view was that Sheldon disappeared mysteriously into the deserts of Nevada (conversation notes, DHW & WHB, 7 Jan 1981).

Other Early Collections

Among the sheets of the six resident pioneer botanists (Howell, Cusick, Henderson, Leiberg, Gorman, and Sheldon) whose herbaria form the core of ORE are specimens from most of the prominent collectors of the west. The most significant can be identified by the number of their specimens found in the type collection at ORE. Wilhelm N. Suksdorf (1850-1932) is represented by over a hundred type specimens. Because he exchanged specimens with most of the Oregon botanists mentioned above, it is no surprise that ORE has such a rich trove of specimens from this most prolific of Northwest collectors. Other botanists from this era represented by a dozen or more type specimens at ORE are A.D.E. Elmer, A.A. Heller, M.E. Jones, A. Nelson, C.V. Piper, and C.G. Pringle. Somewhat fewer than a dozen type specimens came from E.L. Greene and S.B. Parish.

Although no types are included among their specimens, the bryophyte herbarium was established with the acquisition of moss collections from A.S. Foster (????-1922?; not Adriance Sherwood Foster, 1901-1973, plant morphologist and anatomist at Berkeley) and M.A. Flinn (1841-1924), who practiced medicine in Vancouver, Washington, just after the turn of the century. It seems likely that these collections arrived with Gorman's herbarium some time after 1926. Henderson collected a large number of bryophytes between 1930 and 1935 (a few from the 1880's) but he never mastered these plants. His collections, though numerous, are rather mundane. A set of specimens from F.A. MacFadden (1888-1964), mostly from Washington and SW Canada, was presumbly obtained about this time.

The lichen and fungus collections were established by Sweetser, another of his significant contribution to the herbarium. He collected few vascular plants. He prepared at least one lichen exsiccata (a reference set of predetermined lot size and fixed number of duplicates) and purchased or received in exchange several early exsiccatae. A.S. Foster collected lichens as well as mosses. Included in the lichen (and bryophyte) collections are a few specimens from nearly all the early botanists, but none are rarities. (Leiberg made significant collections of mosses but very few of these are at ORE).

Official Curator's Position Begins In 1936

In 1936 a Museum of Natural History was created at the University of Oregon by the State Board of Higher Education, with the Herbarium as one of the four units (the others being the Condon Museum of Geology, Museum of Zoology, and Oregon State Museum of Anthropology). This was an organizational strategy prompted by Luther S. Cressman, curator of the anthropology collections and new director of the unified museum. It helped to keep these collections at the University of Oregon during the Great Depression, when the state legislature was attempting to consolidate humanities at the University of Oregon and sciences at Oregon State University.

FROM UO HERBARIUM FILES NOW AT OSU, CORVALLIS

LeRoy Detling

Although Henderson was formally designated curator of the herbarium at this time, his health (particularly his eyesight) was failing, and assistance was needed. leRoy Detling (1898-1967) was hired to help on a part-time basis. Detling had been an instructor of Romance Languages at the university and was inspired by Henderson to study botany at Stanford (M.A., 1933; Ph.D., 1936). Detling assumed full duties as curator when Henderson retired in 1939 at the age of 86. During the thirty years Detling worked at ORE the most significant additions to the herbarium were Detling's own collections, numbering almost 10,000, and exchanges based on them. Of note are the specimens on which were based his monographs on *Cardamine (Dentaria)*, *Descurainia*, and *Lupinus*. He became as much an ecologist as taxonomist, focusing on biogeography in his later years. The meticulous, detailed ecological data on his specimen labels are much admired. He collected in all of the far West, though mainly in Oregon, and went to Mexico several times to collect and pursue his studies of the origin of the western flora (published posthumously as ***Historical Background of the Flora of the Pacific Northwest*** and still available from the UO Museum of Natural History).

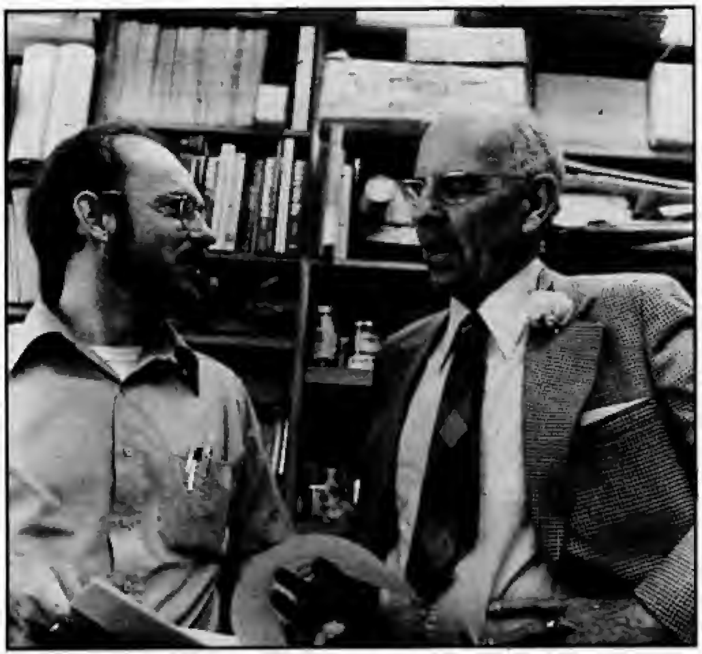
Detling was curator until his sudden death in late 1967. The herbarium was cared for by his wife, Mildred R. Detling (1915-), until a new curator could be found. As a part of the search process Arthur R. Kruckeberg of the University of Washington was invited to visit the herbarium and prepare a report assessing the status and needs of the herbarium. His report, presented in March 1968, outlined the strengths of the herbarium and gave suggestions to encourage the herbarium to prosper.

In 1969 Georgie Mason (1910-) accepted the post of acting curator. She continued with this "acting" title until her retirement seven years later. Previously Mason had worked at Oregon State University, where she had obtained her M.S. in 1960. She had been working on plants of the Wallowa Mountains for some time, and carried out annual collecting trips to that area until the 1975 publication of ***Guide to the Plants of the Wallowa Mountains of Northeastern Oregon***. In addition to the Wallowa Mountain plants, Mason enriched the herbarium with a concerted effort to document two groups of plants, adventives and aquatics, that had been all but ignored by previous botanists at ORE.

In 1963 the collection of Oregon's best known woman plant explorer, Lilla I. Leach (1886-1980), was donated to the University of Oregon. The approximately 3,000 specimens were mostly unmounted, usually with only sparse collecting notes on the folders. It fell to Mason to prepare labels, mount and accession the collection, and distribute duplicates. The Leach collection is especially valued because she and her husband, John R. (1882-1972) spent so much time collecting in southwestern Oregon, a floristically rich and still underexplored region. Lilla Leach is best known for the discovery of *Kalmiopsis leachiana*, a species named by Henderson in 1931 and established as a monotypic genus by Rehder in 1932. In all, fourteen plant names are based on her finds. She claimed priority in the discovery of two others species which, however, were described from collections of other botanists.

In 1974 Mason incorporated the collection of Orlin I. Ireland (1895-1973) into the herbarium. An avid amateur botanist, for many years Ireland had worked one evening each week in the herbarium. He collected at sites as far afield as Alberta and Nevada, but showed special interest in plants of the central Oregon Cascades. With Detling's guidance, Ireland's ***Plants of the Three Sisters Region*** was published in 1968 as Bulletin 12 of the UO Museum of Natural History. Between 1934 and 1970, when he ceased collecting, he had reached over 3,800 collections. As with the Leach collection, the specimens were mostly unmounted but in this case carefully kept notebooks made label-typing fairly straightforward.

Georgia Mason's curatorial work included two activities which substantially improved the collections. With the support of the Museum, a sufficient number of new herbarium cases were obtained to reorganize and spread out the collections so that there was room for insertion of new material at the top and bottom of each case. This involved replacing almost all of the genus and species covers (folders), which by this time were so brittle they were little more than sheets of manila separating the species. She also begain formally accessioning the specimens, stamping each with an identification indicium and a unique number (as recommended in Kruckeberg's 1968 report).



David Wagner, left, with L. Constance, Fall 1980.

FROM UO HERBARIUM FILES NOW AT OSU, CORVALLIS

Upon Mason's retirement in 1976, David Wagner (1945-) was appointed as curator. Wagner came to ORE from Washington State University, where he had done his doctoral reearch under Marion F. Ownbey. The Museum of Natural History was reorganized in 1977-1978, with the Herbarium being transferred to the Biology Department for office support and academic matters while the Dean of the College of Arts and Sciences retained direct administrative and budgetary authority. Although the dismembering of the museum diminished interactions among museum staff, it greatly improved the integration of the herbarium with the teaching and research activities of the Biology Department. In 1979 Wagner was designated Director of the Herbarium, and in 1982 promoted to the rank of Associate Professor of Biology.

Wagner continued the numbering and stamping of specimens. Mason had reached almost 40,000. Lichens, mosses, and liverworts were included in the accessioning. Accessioning was completed in January 1979 with number 100,017. Previous estimates of the entire holdings of ORE had ranged from 150,000 (1968) to 200,000 (1976) sheets. (This suggests that most figures for the size of collections, where not based on actual numbers from notebooks or accession records, are probably over-estimates). In addition to simple accessioning, possible type specimens were segregated and duplicates pulled for distribution in exchange. Original publications were consulted to establish or reaffirm the status of each type specimen and an annotated catalog prepared and stored in a computer database. Linda A. Vorobik, herbarium assistant 1978-1982, was largely responsible for doing the bibliographic work on the type collections catalog. In 1993 there were computerized records for 1,100 specimens in the ORE type catalog.

Much of Wagner's curatorial energy went into dealing with the considerable backlog of unprocessed material. The greatest challenge was curating Henderson's unmounted duplicates, stored for decades in cardboard boxes on the tops of cabinets. The boxes contained, in addition to Henderson's own voluminous material, much original material from Gorman's herbarium. Henderson kept his material in a taxonomic sequence; he would insert later collections into earlier folders of the same species. Gorman's unmounted specimens were also interspersed among Henderson's. This required careful unwrapping of the bundles to sort out individual collections. Labels often needed to be prepared from handwritten notes on the folder margins, supplemented with dates from already-mounted specimens when these could be found in the general collection. After incorporating original material, several thousand specimens were distributed in exchange. Special recognition for meticulous work goes to Kimberly St. Hilaire (herbarium assistant 1983-1984) and Chester A. Wilson (herbarium assistant 1984-1986).

Large personal collections acquired during this period included 791 specimens from southwestern Oregon from C. David White (1940-) in 1976; 897 mostly New York specimens from Sanford S. Tepfer (1910-) in 1977; 1,505 specimens, including several hundred European pteridophytes, but mostly midwestern plants, of J. Frederick Brenckle (1875-1957), donated by his daughter Bea LeFevre in 1979; 750 specimens of the western central Oregon Cascades from James C. Hickman (1941-1993) in 1982; and 607 specimens, documenting Myrtle Island Research Natural Area in Douglas County and Golden and Silver Falls State Park in Coos County, from Ralph L. Thompson (1943-) in 1990-91. Well in excess of 1,600 specimens, mostly from Alaska and the Yukon but also a large number from southwestern Oregon, were donated to the herbarium over the years 1965 through 1982 by Maxcine M. Williams (????-1983). After identifying the plants, frequently with the aid of Stanley Welsh at Brigham Young University, she mounted and accessioned the specimens herself, coming into the herbarium every winter after her summer's field work.

For the first time since Sweetser, attention was given to the non-vascular plants housed in the herbarium. Although there was a considerable amount of material, none was properly curated or accessible. The best collections were of lichens, as mentioned above. Other than a few miscellaneous collections by botanists mentioned above, the most significant recent acquisition was that of Frank P. Sipe (1887-1975).

Sipe had been a biology faculty member whose personal cryptogamic collections were housed in the herbarium and acquired upon his death. His collections consisted mainly of lichens and fleshy fungi. There being no indication of interest in herbarium work with fungi among the faculty at Eugene, all fungi — both Sipe's and the classical material assembled by Sweetser — were transferred to Oregon State University on permanent loan in 1976. Attention was turned to Sipe's collection of c. 2,000 lichens. The specimens were repacketed, relabeled, and accessioned. Sipe's ample, oversized field packets generated many sets of duplicates. His collections are notable for having the types of 26 names, mostly described by H.A. Magnusson and V. Gyelnik. Present are valuble exchange specimens from Y. Asakawa, M.P. Tomin, and A.W. Herre. Sipe's collection also included c. 250 mosses and a handful of liverworts.

A most significant addition to the lichen herbarium came in 1978-79 when Lawrence H. Pike (1943-) presented his personal collection and library (books and reprints) to ORE. The collection of over 3,000 specimens came excellently packeted and labeled, and needed only to be accessioned and filed. Other significant original lichen collections have been presented by Daphne F. Stone (1952-) and Sanford S. Tepfer (1910-). S. Shushan, W.A. Weber and C. Wetmore are well represented by exchange material. D.F. Stone, former graduate student and volunteer, deserves much credit for helping to bring the nomenclature and organization of the lichen collections up to date.

The moss collection was also refurbished and reorganized. There are no truly outstanding individual collections present. Henderson's collections are most numerous, but, as mentioned above, relatively mundane: common species collected repeatedly. A significant amount of useful, original material has come from John A. Christy (1952-), L.H. Pike, Charles Edson, and D.H. Wagner. Collections of T.C. Frye, V.J. Krajina, E. Lawton, and R. Spjut are represented by a significant number of specimens received in exchange. In 1993 there were 3,700 mosses. Their excellent state of organization is due especially to volunteer work by D.F. Stone and J.A. Christy.

The liverwort collection has been built up almost entirely by the efforts of Wagner, who took up the group as an area of special interest upon coming to ORE. The case marked "Hepaticae" had only seventeen specimens filed in it in 1976, although a certain amount of uncurated material was stored in various corners of the herbarium. Henderson's material had a fair number of specimens that had been identified by Ethel Sanborn, a biology faculty member at the University from 19?? to 1932. She published ***Hepaticae and Anthocerotae of Western Oregon*** (the last major publication on this group for the state) in 1929, but the collections upon which this is based were taken with her to Oregon State University when she moved there in 1932.

As part of a project to write a guide to the liverworts of Oregon, Wagner has collected over 3,000 specimens from Oregon with many numbers from Alaska to California to Idaho. These are well-studied collections with critical notes on oil-bodies included. Important duplicate collections of liverworts from L. Clark, C. Edson, T.C. Frye, W.S. Hong, R. Spjut, and S.S. Tepfer have been added.

The Moves Of The Herbarium

The herbarium was originally housed in Deady Hall, the first building on campus. In 1928 it was moved to Friendly Hall, about 1932 moved to Condon Hall, and then moved to the Natural History Building in 1952. The herbarium was moved to a site close to the Willamette River in 1987, its entrance being appropriately located at the corner of Moss Street and Garden Avenue.

The final move was made in 1993. The force behind this move came from three directions. On the one hand, the university desired to use the space where the herbarium was located to develop a research park. At the same time the university was mandated by citizen initiative (known as Measure 5) to make drastic budget cuts. The third major consideration was that for many years the Biology Department at the University had been shifting focus from traditional disciplines to molecular and theoretical approaches. It was decided that the herbarium would be closed. An agreement was reached with Oregon State University to transfer ORE to Corvllis and merge the two universities' herbaria. The transfer was completed in June 1993, marking the end of 90 years of ORE as a distinct entity.

Acknowledgements

I would like to give special thanks to Keith Richard, archivist for the University of Oregon, for endless assistance with historical questions. I have learned much about ORE's past players from conversations with Mildred Detling, Georgia Mason, Kenton Chambers, John Christy, and Lincoln Constance. Rhoda Love, Art Kruckeberg and David Kennedy have read the manuscript and made helpful suggestions. Finally, I would like to thank the many people of our region, botanists and others, who have supplied unwavering encouragement and moral support during the seventeen years of my curatorship.

Descriptive Key To Oregon Penstemons

By ROBIN LODEWICK

Penstemon, with 271 species (mostly western) is the largest genus of flowering plants native solely to North America. Oregon ranks as fifth among the states in number of species, after Utah, California, Colorado and Nevada.

This key covers the 46 Penstemon species native to Oregon (3 rare, 1 possibly a hybrid) and 2 species from other genera once included in Penstemon *(Keckiella* and *Nothochelone)*. It is meant for the amateur botanist who uses a 10X magnifier and centimeter rule as aids, and cannot return weeks later for seed. Ranges and subspecies given are for Oregon. Botany manuals should be used for verification (see references at end).

P. davidsonii

General Description

The corolla is the distinguishing feature of the genus. Bell-shape or tubular with 5 lobes (2 above, 3 below), it has a near-unique pattern of 4 stamens (each with 2 anther sacs attached at the tip) and one sterile stamen (staminode), which is usually as long as the stamens and has a slight yellowish beard at the tip; sometimes it is exserted outside the corolla mouth. Such a staminode occurs in 7 other genera, worldwide: 2 tropical, 5 (with 15 species) near relatives of Penstemon. (The relatives have stamens with hair at the base; penstemon stamens look bare at the base.)

Corolla color is mainly shades of blue-purple or red-purple, rarely red, pale yellow or white (blue-purple species may have white or pink variants). In Oregon, the corolla is usually expanded abruptly, more or less widely, from a narrow tube; sometimes it is expanded gradually, slightly; sometimes it is pleated underneath. Outside, the corolla is usually glabrous; usually it has a slight yellow or white beard, and often purplish guidelines, either within or on the lower lip.

The corolla lobes are usually 1/4-1/5 as long as the corolla, with lower lobes slightly longer than upper ones. The 5 sepals, usually 1/3-1/4 as long as the corolla, are lanceolate or sometimes ovate, often slightly scarious. A long-exserted staminode may reach the end of the corolla lobes.

Stem and inflorescence are usually leafy. The inflorescence is an indeterminate thyrse, usually of 2-5 nodes, with opposite cymes (usually determinate and 2-several flowered), or sometimes raceme-like. The inflorescence is usually at least slightly pubescent.

Penstemons may be shrubs or herbs. Species that branch between base and inflorescence are shrubs (all woody) or subshrubs (with upper branches soft and dying back); they have no basal leaves but often form mats. Most Oregon species (25) are perennial herbs (with stems soft, not branching between base and inflorescence, and dying back to a branched woody base); they usually have basal leaves in a rosette, or tufted on short non-flowering stems.

Leaves in most species vary in shape. Usually lowest leaves are borne on petioles, upper leaves are sessile. In herbs basal leaves are usually oblanceolate or obovate, lower stem leaves oblong, upper ones lanceolate or ovate. Usually leaves are glabrous, green (sometimes grey-green or blue-grey glaucous), and sharp-tipped. Leaves are opposite except in four species (all found in Oregon) where they may be alternate, or 1-4 at a node (see 26, *deustus*, 27, *gairdneri*, *seorsus*, 14, *triphyllus)*.

Classification in Penstemon is based mainly on the method of opening, shape, and pubescence of the anther sacs; to see fully open sacs, look at fading flowers. (Illus. shows sac shapes.)

Use Of The Key

The actual key consists of the words in boldface, which form contrasting couplets (i.e., 02 **Subshrub;** 02 **Herb**). The rest of the description helps identify confusing species.

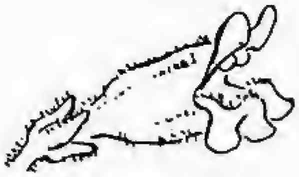
A description given in the introduction, or at any level of the key, applies to all species below it unless a variation is stated. Such descriptions are not repeated unless necessary. For instance, "inflorescence usually pubescent" means that the statement is true of more than half the following species. Where a species does have a glabrous inflorescence, its description will say that (or, "herbage glabrous," or "sometimes glabrous"). In subsection Proceri, however, where all herbage is usually glabrous, "inflorescence pubescent" is said when necessary.

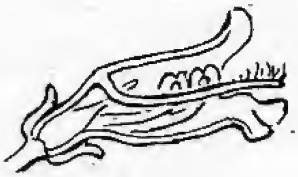
Note that some characteristics used in most keys are rarely mentioned here, because they are hard to see and not necessary for identification. These include pubescence on the stem, glandular (sticky or glistening) pubescence, and size of anther, seed, and capsule. (Anther sac and seed are usually less than 1.5 mm long, large in subgenera *Habroanthus* and *Saccanthera*. Seed is heavy, angular, ridged. Capsule splits at tip into four sections.)

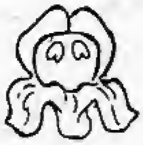
Regard "medium size" as usual. In this key, for leaves, medium length means between 30 mm and 100 mm long: medium width, 1/5-1/7 as wide as long. Medium size corollas are between 15 mm and 25 mm long, from base of ovary to end of lobes. Large or long, small or short, mean as compared to medium. (Most measurements are made on dried plants; living plants are often slightly larger.)

And remember Murphy's Law for Botanists: any plant you choose to examine is probably abnormal — simply because the human eye notices the unusual!

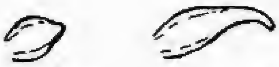
COROLLA:

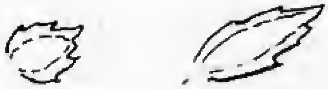

pubescent,
with anthers
exserted and
lip bearded


inside view,
with staminode
exserted and
bearded

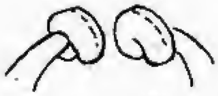

corolla
front view,
with guidelines

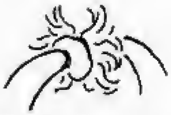
SEPALS:

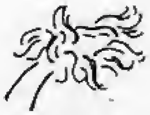

slightly scarious


scarious erose

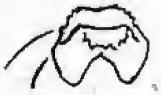
ANTHER SACS:

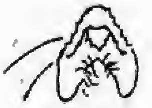

unopen

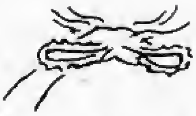

wooly, unopen

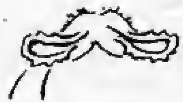

wooly, open

open partway:

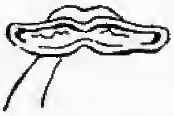

from inner end,
bag-shape

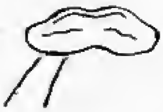

arrowhead-shape
hairy

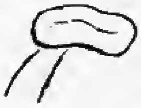

from outer end,
horn-shape,
with long hair


S-shape,
with short hair

open all the way:


boat-shape


explanate


peltate-explanate

Illustrations by Robin Lodewick

01 **Anther sacs wooly-pubescent** (open end to end & across connective, but hidden in white fuzz)
Leaves toothed (in 2 species, sometimes entire) Corolla usually large, expanded gradually, pleated underneath, with mouth slightly closed; lobes often small, projecting; no guidelines
(P. Subgenus *DASANTHERA* & Genus *NOTHOCHELONE*)

02 **Subshrub,** less than 40 cm tall (2 species, less than 10 cm)
Cyme to 1 cm long, 1-flowered (in 1 species, 1-2 flowered)
Leaves thick, broad (in 1 species sometimes narrow); upper stem leaves reduced
Staminode 1/2 length of stamens (Subgenus *DASANTHERA*)

03 **Inflorescence often long, 4-8 nodes**
Leaves elliptic, to 40 mm long & 2/5 as wide
Corolla rose-pink, 27-33 mm long
Anther sacs show as white spots in mouth
s Josephine Co. (as *P. cardwellii* hybrid?) *NEWBERRYI* var. *berryi*

03 **Inflorescence short, 1-3 nodes**

04 **Leaves blue-glaucous,** ovate at least above
Sepals ovate

05 **Cyme 1-2 flowered;** inflorescence glabrous; lower leaves obovate, to 80 mm long & 1/3 as wide; upper leaves to 35 mm & 2/3 as wide
Calyx 5-7 mm long
Corolla pale red-purple, 25-38 mm long
Staminode not bearded
Columbia Gorge cliffs in Hood River & Wasco counties (RARE)
BARRETTIAE

05 **Cyme 1-flowered**
Leaves small, blunt, to 20 mm long & 2/3 as wide
Plant to 10 cm tall
Corolla rose-red, 25-36 mm long; not bearded
Staminode sometimes not bearded
high Cascade Range & Columbia Gorge RUPICOLA

P. rupicola

04 **Leaves green, not glaucous**
Corolla blue-lavender or blue-purple (rarely, pale red-purple

06 **Leaves elliptic, medium size,** usually 1/3-1/4 as wide as long
Corolla 25-40 mm long

07 **Leaves just below inflorescence broat at base;** lower leaves to 40 mm long
w Side of Cascade Range, Coast Range; sw OR *CARDWELII*

07 **Leaves just below inflorescence taper to base;** lower leaves to 60 mm long (sometimes varying to narrow, 1/4-1/7 as wide as long); leaves sometimes entire
Inflorescence often one-sided
e side of Cascade Range, c OR to n & e OR
FRUTICOSUS var *fruticosus*

06 **Leaves ovate, small**

08 **Leaves strongly toothed,** to 25 mm long & 1/2-2/3 as wide
Plant to 20 cm tall
Corolla 30-40 mm long
e Wallowa Co. *FRUTICOSUS* var. *serratus*

08 **Leaves entire** (in Oregon, except hybrids), to 20 mm long & 1/2-2/3 as wide
Plant to 10 (rarely 15) cm tall *DAVIDSONII*

08a Corolla 34-45 mm long
Steens Mtn. *DAVIDSONII* var. *praeteritus*

08a Corolla 20-36 mm long
Leaves usually blunt (hybrids in Marion Co. toothed)
high Cascade Range *DAVIDSONII* var. *davidsonii*

02 **Herb, 30-80 cm tall,** usually growing in woods
Cyme 1-3 cm long, 1-4 flowered, spreading away from stem
Leaves all on petiole, to 110 mm long & 1/3 as wide; no basal leaves
Corolla pubescent, pale or deep red-purple, 25-35 mm long; not bearded
Stamens & staminode hairy at base; staminode bearded most of its length
w side of Cascade Range; Coast Range *NOTHOCHELONE NEMOROSA*

01 **Anther sacs glabrous, or** (in 6 Oregon species) **slightly hairy-pubescent**

09 **Anther sacs open partway,** narrowly, remaining closed at one end; sacs toothed along edge of opening
Corolla expanded abruptly, widely (except in 1 species), often large (in 4 species sometimes small); usually not bearded

10 **Anther sacs open partway from inner end,** across connective; outer ends remain closed (saddlebag or arrowhead shape); hairy-pubescent in 5 species (See also 40, *globosus*, 44, *euglaucus*)
Cyme usually 1-3 cm long, 1-3 flowered, sometimes longer and many-flowered
(P. Subgenus SACCANTHERA)

11 **Leaves toothed** (in 3 species sometimes entire)

12 **Subshrub,** between 20 & 80 cm tall

13 **Leaves narrow to base, or most leaves on petiole**
Corolla pubescent; rarely, lip bearded
Staminode moderately exserted

14 **Upper leaves not all opposite, 1-4 at node,** often narrow, rarely entire, to 50 mm long & 1/5-1/8 as wide; lower leaves 1/2 as wide
Cymes 1-3 at a node, 1-5 flowered (sometimes to 8 cm long & 15-flowered)
Corolla expanded gradually, slightly, sometimes small, blue-lavender to violet, 13-19 mm long
ne OR *TRIPHYLLUS*

14 **Leaves opposite**
Corolla pale or bright red-purple
Cyme 1-2 flowered *RICHARDSONII*

14a **Corolla 22-32 mm long**
Staminode bearded 1/2 its length

14b Leaves deeply toothed, to 80 mm long & 1/3-1/5 as wide
c OR to north, Columbia Gorge, ne OR
RICHARDSONII var. *richardsonii*

14b Leaves moderately toothed, often grey-pubescent, to 50 mm long & 1/2 as wide
c & nc OR *RICHARDSONII* var. *dentatus*

14a **Corolla 15-20 mm long**
Staminode not bearded
Leaves usually like var. *dentatus*
Wheeler & Wasco counties *RICHARDSONII* var. *curtiflorus*

13 **Upper leaves rounded at base, sessile**
Corolla usually with no guidelines
Inflorescence glabrous, or essentially so
Sepals often scarious erose

15 **Stamen-filament hairy just below anthers** (only Penstemon like this)
Cyme rarely to 8 cm long & 5-flowered
Leaves long, often entire, to 120 mm long & 1/4 as wide
Calyx 3-7 mm long
Corolla bright red-purple, sometimes blue-violet, 25-38 mm long; lobes ciliate-edged
ne OR *VENUSTUS*

15 **Stamen-filament glabrous**
Cyme 2-5 flowered (rarely to 6 cm long & 10-flowered)
Leaves very broad, coarse-toothed, to 90 mm long & 1/2 as wide
Calyx 5-11 mm long; sepals sometimes broad-scarious & deeply erose
Corolla blue-purple, sometimes red-purple, 16-28 mm long
Coast Range & w side of Cascade Range, from Lane Co. north
SERRULATUS

12 **Herb,** 40-100 cm tall
Herbage all sticky-pubescent
Leaves very long; basal leaves to 350 mm long & 1/4 as wide; upper leaves to 120 mm & 1/2 as wide
Cyme 1-2 cm long; 2-4 flowered
Corolla pubescent, dull lavender-purple, 28-40 mm long; rarely bearded
Staminode not bearded, long-exserted *GLANDULOSUS*

12a Leaves strongly toothed
ne OR — *GLANDULOSUS* var. *glandulosus*
12a Leaves entire, or nearly so
n Hood River & Wasco counties — *GLANDULOSUS* var. *chelanensis*

11 **Leaves entire** (see also 12, *glandulosus,* 14, *triphyllus,* 15, *venustus*)
Subshrub, mainly between 20 & 50 cm tall
Corolla shades of blue-purple (rarely, red-purple or pink); pale or white guidelines show as 2 dots at lip; bud often yellow
Inflorescence bare-looking, with long internodes (except in 2 species)
Staminode usually not bearded

16 **Corolla with lip bearded,** 13-20 mm long
Staminode bearded
Leaves to 100 mm long & 1/8-1/10 as wide, often arched, folded; grasslike
Plant to 70 cm tall
Cyme sometimes to 5 cm long & 7-flowered
s Lake Co. — *GRACILENTUS*

16 **Corolla lip not bearded**
Anther sacs hairy at inner end (in 15 species) or glabrous (in 1 species)

17 **Herbage glabrous, blue-glaucous**
Upper leaves very broad, 1/2 as wide as long; lower leaves 1/4 as wide
Calyx 3-6 mm long
Staminode rarely slightly bearded

18 **Corolla 20-30 mm long**
Leaves to 60 mm long
sw OR — *AZUREUS* var. *azureus*

18 **Corolla 14-20 mm long**
Leaves often short, to 35 mm long
Plant to 35 cm tall
sw OR — *PARVULUS*

17 **Herbage pubescent, grey-green or grey**
Leaves medium width or narrow, 1/6-1/10 as wide as long

19 **Corolla pubescent**

20 **Herbage densely grey-pubescent**
Anther sacs glabrous
Inflorescence leafy
Corolla purple or blue-purple, 15-22 mm long
Leaves to 50 (sometimes 80) mm long, often folded, arched
s Malheur Co. — *KINGII*

20 **Herbage moderately pubescent, grey-green**
Corolla blue-violet with blue lobes

21 **Anther sacs narrow at top,** arrow-shape
Corolla 20-30 mm long
Leaves to 70 mm long, 1/8 as wide as long
sw OR — *LAETUS* var. *sagittatus*

21 **Anther sacs broad at top,** saddlebag-shape
Corolla 14-24 mm long
Leaves to 70 mm long, 1/6 as wide as long
Wheeler Co. south to sw OR — *ROEZLII*

19 **Corolla glabrous,** blue-violet or pink-lavender, 15-25 mm long
Inflorescence leafy; cyme sometimes to 4 cm long & 5-flowered
Herbage slightly pubescent, grey-green
Leaves to 70 mm long, often not quite opposite
Sepals sometimes slightly erose
Baker Co. to e & se OR — *CUSICKII*

10 **Anther sacs open partway from outer end;** inner ends remain closed, or rarely open narrowly across connective (horn-shape); sacs hairy-pubescent in 1 species
Corolla bright blue, slightly narrowed at mouth; lobes spreading; no guidelines
Leaves entire, thick, firm; basal leaves very long, often narrow; upper leaves long or broad
Inflorescence often long; cyme 1-2 cm long, mainly 2-4 flowered
(*P.* Subgenus *HABROANTHUS*)

22 **Upper leaves very broad,** 1/2 as wide as long

23 **Anther sacs pubescent with short stiff hair, S-shape**
Basal leaves to 250 mm long & 1/7 as wide; upper leaves to 90 mm
Corolla 25-35 mm long
Plant 20-60 cm tall
Staminode bearded
n Wallowa Co. *PENNELLIANUS*

23 **Anther sacs glabrous, straight**
Basal leaves to 160 mm long & 1/4-1/6 as wide; upper leaves to 70 mm
Calyx 5-6 mm long
Corolla 18-28 mm long
Plant 10-70 cm tall
Staminode sometimes bearded
Wallowa Mtns. *PAYETTENSIS*

22 **Upper leaves medium width or narrow,** to 100 mm long & 1/5-1/8 as wide; basal leaves to 150 mm & 1/7 as wide
Anther sacs glabrous, S-shape
Corolla 25-38 mm long
Calyx 4-8 mm long (rarely to 13 mm); sepals slightly scarious erose, sometimes with long narrow tip
Herbage sometimes grey-pubescent
Plant sometimes very short, 5-90 cm tall
Staminode rarely bearded
e of Cascade Rang to e & s OR *SPECIOSUS*

09 **Anther sacs open all the way** end to end & across connective, narrowly (boat-shape) or becoming flat (explanate) (except in 40, *globosus*, 44, *euglaucus*)
(*P.* Subgenus *PENSTEMON* & Genus *KECKIELLA*)

24 **Shrub or subshrub**
Corolla pubescent
Leaves in 3 species sometimes not opposite

25 **Corolla pale yellow or white,** usually small; usually with dark guidelines
Leaves toothed (in 1 species sometimes entire)

26 **Shrub, with stems bare-looking,** 15-150 cm tall
Corolla pale yellow, expanded widely to gaping mouth, 10-14 mm long; upper lobes hooded, tinged brown, lower lobes reflexed; not bearded
Leaves ovate, very broad, to 60 mm long & 1/2-1/3 as wide
Cyme 3-4 cm long, 1-4 flowered (sometimes longer & many-flowered)
Calyx 4-7 mm long
Stamens & staminode hairy at base; staminode dense-bearded 1/2 its length, long-exserted
s Jackson Co. (RARE) *KECKIELLA LEMMONII*

26 **Subshrub, with stems usually leafy,** mainly 20-60 cm tall (sometimes, as in se OR, bare-looking with few leaves)
Corolla white or pale yellow, often tinged brown or lavender, glistening within, usually expanded gradually, slightly; upper lobes very small, lower lobes spreading
Cyme short, to 1 cm long & 1-4 flowered (rarely longer & 5-8 flowered); inflorescence long, narrow, of 3-9 clusters
Leaves often leathery, varying on different plants, either lanceolate or ovate; lower leaves sometimes obovate, blunt
Calyx 2-6 cm long
A variable species *DEUSTUS*

26a **Staminode densely bearded**
Corolla 8-10 (rarely 12) mm long; guidelines sometimes deep purple, crowded
Leaves either lanceolate, coarse-toothed, sharp-tipped, to 60 mm long & 1/3-1/4 as wide, or ovate, nearly entire, often blunt, to 30 mm & 1/2-1/3 as wide
Plant very woody at base
sw OR *DEUSTUS* var. *suffrutescens*

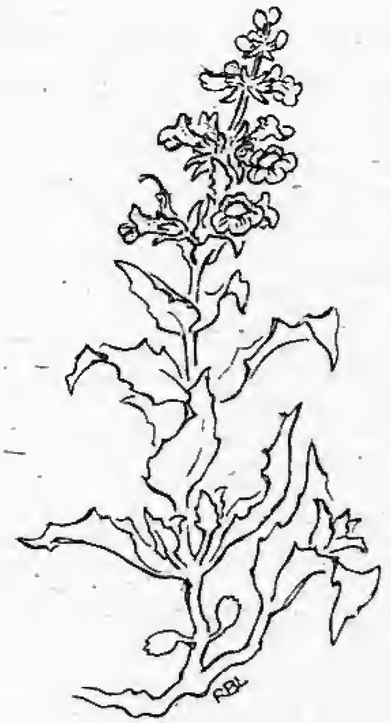
26a **Staminode not, or only slightly, bearded**
Corolla more than 10 mm long

26b **Leaves strongly toothed, opposite, mainly broad,** lanceolate, mainly to 60 mm long & 1/4-1/6 as wide, or ovate, to 40 mm & 1/2-1/4 as wide

26c **Corolla with upper lobes pale yellow or white,** 12-18 mm long (in ne Or, corolla often pure white with no guidelines)
Leaves coarse-toothed (sometimes narrow, to 75 mm long & 1/7 as wide)
w & e slopes of Cascade Range; ec & ne OR DEUSTUS var. *deustus*

26c **Corolla with upper lobes tinged brown,** 10-15 mm long from c OR south, corolla only slightly glistening)
Leaves fine-toothed
Plant usually not over 40 cm tall
Deschutes Co. to s & se OR DEUSTUS var. *pedicellatus*

26b **Leaves slightly toothed at outer end, or entire; leaves usually not all opposite, 1-4 at node, narrow,** to 50 mm long & 1/7-1/10 as wide
Cymes 1-3 at node, 2-5 flowered; inflorescence short
Corolla 10-15 mm long
Staminode sometimes not bearded
c & nc OR DEUSTUS var. *variabilis*


P. deustus

25 **Corolla pink-lavender or blue-violet,** narrow, 13-23 mm long; sometimes no guidelines
Leaves entire, linear, sometimes not opposite, often crowded & heathlike
Plant between 10 & 40 cm tall, matforming
Herbage grey-pubescent
Cymes short, 1 cm long, 1-2 at a node, 1-2 flowered
Staminode with short beard most of its length

27 **Corolla with lobes large** (1/3 length of corolla), spreading; beard slight GAIRDNERI

27a Leaves alternate, 1 to a node, often small, to 35 mm long & 1/10 as wide
Usually 1 cyme to a node
Crook Co. to north; se OR GAIRDNERI var. *gairdneri*

27a Leaves sometimes not opposite, to 50 mm long & 1/15 as wide
ne OR GAIRDNERI var. *oreganus*

27 **Corolla with lobes medium size** (1/4 length of corolla), often projecting
Leaves sometimes not opposite, to 50 mm long & 1/15 as wide
s Harney & Jefferson counties SEORSUS

24 **Herb,** with basal leaves often tufted (in 2 species, no basal leaves)

28 **Staminode with long, dense, golden beard** most of its length, usually long-exserted (in 2 Oregon var. sometimes not exserted)
Corolla pubescent; lower lobes reflexed
Inflorescence dense; cyme 1-2 cm long, 2-6 flowered
Herbage mainly grey-pubescent
Leaves toothed at least near tip, or entire (*P.* section AURATOR)

29 **Corolla with long narrow tube** (at least 1/3 of corolla length), **deeply 2-lipped,** dull purple or blue-violet
Basal leaves to 60 mm long & 1/4 as wide; upper leaves to 40 mm & 1/5-1/6 as wide

30 **Staminode tip coiled**
Corolla sometimes large, 18-28 mm long; tube & lips each 2/5 of corolla length
Plant 8-25 cm tall
s Harney Co. JANISHIAE

P. janishiae

30 **Staminode tip straight,** moderately exserted
Corolla 14-22 mm long; tube & lips each 1/3 of corolla length
Plant 10-40 cm tall
Baker & n Malheur counties MISER

29 **Corolla with short broad tube** (1/5 of corolla length)
Basal leaves long, to 120 mm long, with upper leaves to 70 mm; leaves usually all narrow, 1/7-1/10 as wide as long (sometimes vary to all broad, 1/4 as wide)
Calyx 6-13 mm long; lobes narrow
Plant 10-40 cm tall
(Staminode long-exserted, except in OR) ERIANTHERUS

29a Anther sacs 2/3-1/2 as wide as long, wide at connective
Corolla sometimes large, pink-lavender to violet, 15-27 mm long
Staminode sometimes not exserted; tip coils
e Wallowa Co. *ERIANTHERUS* var. *redactus*

29a Anther sacs 1/2-2/5 as wide as long, narrow at connective
Corolla red-purple to blue-purple, 18-23 mm long
Staminode with slight beard 1/2 its length, tuft at tip, not exserted
nc OR *ERIANTHERUS* var. *argillosus*

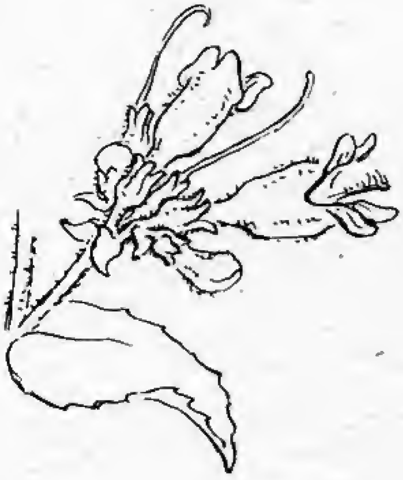
28 **Staminode with pale yellow or white beard** at least at tip, or sometimes not bearded (see also 29, *erianthenus*)

31 **Leaves toothed** (or, in 3 species, sometimes entire); basal leaves long, on long petiole
Cyme sometimes long & many-flowered
Stem in 1 species often bare-looking
Corolla pubescent, sometimes large (in 2 species) or small (in 4 species)
(mainly *P.* section *HUMILES*)

32 **Cyme spreading away from stem,** 2-5 cm long, 2-7 flowered (sometimes longer, to 10 cm & 20-flowered)
Leaves altogether toothed, mainly lanceolate; upper leaves broad, 1/3-1/4 as wide as long
Corolla expanded abruptly, widely, with lobes large
Plant 30-100 cm tall

33 **Staminode long-exserted**
Leaves coarse-toothed; basal leaves tapered to petiole, 1/5 as wide as long
Corolla pale or deep red-purple; lower lobes projecting, long

34 **Corolla usually large, 24-30 mm long**
Basal leaves very long, to 250 mm long, upper leaves to 90 mm
Cyme sometimes long
Plant 30-120 cm tall
Staminode with tuft of long hair at tip
Coast Range & w side Cascade Range, from c OR south
RATTANII var. *rattanii*


P. rattanii

34 **Corolla sometimes small, 13-18 mm long,** sometimes not bearded
Basal leaves to 150 mm long, upper leaves to 60 mm
Cyme often long
Plant 20-90 cm tall
Staminode sometimes not bearded
Crater Lake to sw OR *ANGUINEUS*

33 **Staminode not** (or only slightly) **exserted**
Basal leaves narrowed abruptly to petiole, often ovate, sometimes blunt, to 150 mm long & 1/3 as wide; upper leaves to 100 mm
Corolla blue or blue-purple, sometimes small, 15-23 mm long
Calyx 3-5 mm long
Plant 30-100 cm tall

35 **Leaves coarse-toothed, pubescent**
Cyme sometimes long
Multnomah Co. *OVATUS*

35 **Leaves usually fine-toothed** (rarely coarse toothed or entire), **usually glabrous**
Cyme often long
ne OR *WILCOXII*

32 **Cyme held close to stem,** 1-3 cm long, 2-4 flowered
Leaves toothed at outer end, or sometimes entire, moderately broad to narrow
Sepals sometimes scarious erose
Corolla expanded gradually moderately

36 **Plant 30-80 cm tall,** stem & inflorescence often bare-looking with long internodes
Basal leaves very long, to 200 mm long & 1/7 as wide; upper leaves to 60 mm & 1/4 as wide
Cyme rarely to 6 cm long & 10-flowered
Corolla often small, blue to blue-purple, 11-18 mm long
n Hood River Co. *SUBSERRATUS*

36 **Plant 10-30 cm tall**
Basal leaves to 100 mm long & 1/7 as wide; upper leaves to 50 mm & 1/6 as wide
Corolla blue-violet to red-violet, 15-20 mm long; no guidelines
n Wallowa Co. *ELEGANTULUS*

31 **Leaves entire** (see also 29, *janishiae* to *erianthenus;* 35, *wilcoxii;* 36, *subserratus, elegantulus*)
Inflorescence usually bare-looking with long internodes & 1-many dense separate clusters
Cyme usually short, often many-flowered
Corolla small (in 5 species, sometimes medium size), usually glabrous; shades of blue-purple (or, in 3 species, yellow, white, or pink); lower lobes long, often project; no guidelines (except in 2 species)
Herbage essentially glabrous (except, in 5 species, both inflorescence & corolla pubescent)
Herb, mainly between 10 & 70 cm tall

37 **Stem stout** (to 10 mm diameter in inflorescence)
Leaves ovate, thick, green-glaucous; upper leaves & lower bracts very broad, to 70 mm long & 1/2 as wide; lower leaves to 150 mm & 1/7 as wide
Cyme to 1 cm long, 3-5 flowered, often hidden in bract; inflorescence very long, 5-15 clusters
Sepals usually not scarious
Corolla blue or blue-lavender
Staminode with stubbly beard at tip, or not bearded *ACUMINATUS*

37a Corolla medium size, 15-20 mm long
Upper bracts to 10 mm long & as wide
Calyx 5-11 mm long
Columbia Gorge near Hood R. *ACUMINATUS* var. *acuminatus*

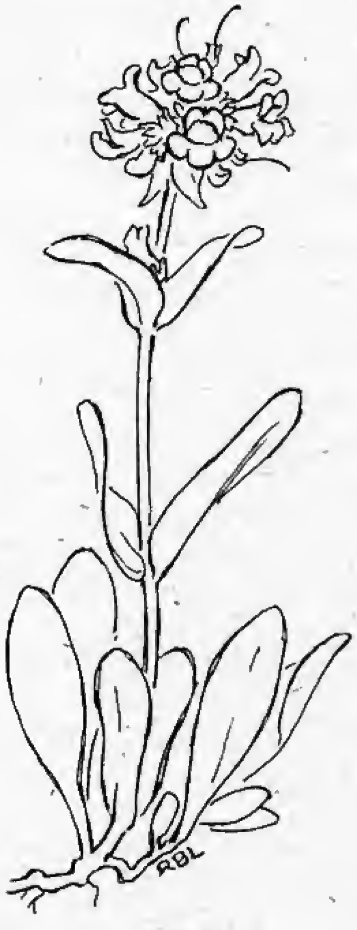
37a Corolla 10-15 mm long
Upper bracts to 10 mm long & 15 mm wide
Calyx 4-7 mm long
se OR *ACUMINATUS* var. *latebracteatus*

37 **Stem slender** (less than 4 mm in diameter in inflorescence)
Cyme 0.5-2 cm long (in 2 species, rarely longer), 2-5 or many-flowered
Sepals usually scarious erose

38 **Leaves broad or medium width;** basal leaves usually many, often tufted, or matlike

39 **Upper leaves large or medium size, with stem often leafy;** leaves to 80 (rarely 120) mm long & 1/3-1/4 as wide; basal leaves long, to 170 mm & 1/4-1/6 as wide (see also 46, *humilis,* 47, *rydbergii, procerus*)

40 **Inflorescence crowded, with one large cluster** (15-25 flowered, often globe-shape), rarely 1-2 smaller clusters below; cyme rarely to 5 cm long
Leaves ovate or oblong
Calyx 5-10 mm long
Corolla expanded moderately, blue-purple or blue, 13-22 mm long
Anther sacs pouch-shape, open partway, narrowly, remain closed at outer ends
ne OR *GLOBOSUS*



P. globosus

40 **Inflorescence bare-looking with long internodes, 3-7 medium-size clusters,** reduced above; inflorescence pubescent; cyme rarely to 8 cm long (held close to stem) & 12-flowered
Leaves lanceolate, taper to long tip
Calyx 4-7 mm long; sepals taper to long tip, sometimes not erose
Corolla pubescent, blue (with dark buds), blue-violet, white or pale yellow
Plant 30-90 cm tall
ne OR *ATTENUATUS*

40a Corolla 14-22 mm long *ATTENUATUS* var. *attenuatus*

40a Corolla 7-14 mm long
wetlands *ATTENUATUS* var. *palustris*

39 **Upper leaves reduced &/or few, upper stem usually bare-looking** with long internodes
Basal leaves mainly medium size, to 100 mm long & 1/4-1/6 as wide (rarely varying to 20 or 150 mm long, or 1/2-1/7 as wide)

41 **Corolla pale yellow or white** (see also 40, *attenuatus*, 48, *peckii*)

42 **Corolla pale yellow,** 8-12 mm long, narrow, drooping
Sepals erose at sides, with long narrow tip; calyx 3-5 mm long
Bracts often scarious erose
Inflorescence often long, 2-10 clusters
ne OR; n Sherman Co. *CONFERTUS*

42 **Corolla white,** expanded slightly, 11-15 mm long
Sepals usually erose at outer end; calyx 4-8 mm long
Staminode bearded 1/2 its length
Steens Mtn. eastward *PRATENSIS*

41 **Corolla shades of blue-purple,** white within showing abruptly in lower lip

43 **Leaves blue-glaucous,** 1/4-1/5 as wide as long
Calyx 3.5-6 mm long
Corolla 11-15 mm long

44 **Sepals ovate, narrowed abruptly to long tip,** sometimes not erose
Leaves mainly elliptic, to 110 mm long
Corolla expanded moderately; guidelines
Plant 15-50 cm tall
Anther sacs rarely not open all the way to outer end, pouch-like
Cascade Range from c OR north *EUGLAUCUS*

44 **Sepals lanceolate, taper to tip,** not erose
Leaves ovate, to 60 mm long
Plant 30-35 cm tall
Staminode sometimes not bearded
Gearhart Mtn., Lake Co. (RARE) *GLAUCINUS*

43 **Leaves green** (or, in 1 species, often grey-green pubescent)

45 **Corolla pubescent,** expanded moderately; lobes spreading
Inflorescence pubescent

46 **Corolla with large lobes** (1/3 its length), blue-purple, 10-17 mm long
Plant 5-60 cm tall (short at high elevations)
Basal leaves vary between 20 & 100 mm long; upper leaves not always reduced; leaves often grey-green pubescent
Sepals not erose
A variable species
e OR south to Ca *HUMILIS* var. *humilis*

46 **Corolla with small lobes** (1/5 its length), blue-violet, 10-13 mm long; with guidelines
Plant 10-25 cm tall
Basal leaves broad, often blunt, to 60 mm long & 1/3 as wide; leaves green
high in Wallowa Mtns. *SPATULATUS*

45 **Corolla glabrous**
Upper leaves sometimes not reduced

47 **Corolla 10-14 mm long**
Basal leaves long, to 150 mm long & 1/7 as wide
Inflorescence of 1-6 clusters
Calyx 3-9 mm long *RYDBERGII*

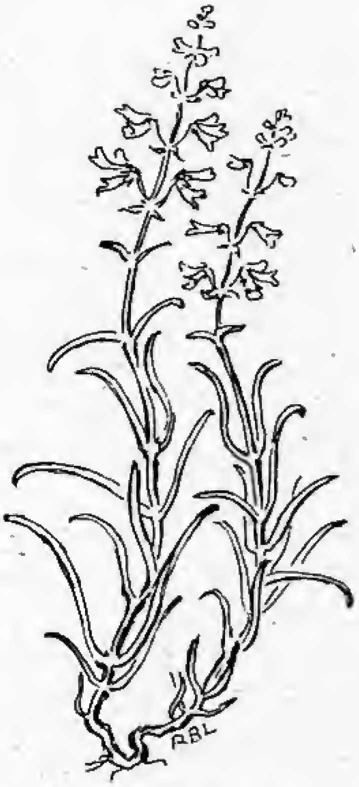
47a Sepals broadly scarious, deeply erose, flat-ended or with short tip
Steens Mtn. & ne OR *RYDBERGII* var. *rydbergii*

47a Sepals moderately scarious, usually erose, tapering to long tip
e of Cascade Range & Multnomah Co.
RYDBERGII var. *oreocharis*

47 **Corolla 6-11 mm long,** deep blue-purple (in Oregon), drooping
PROCERUS

47b **Basal leaves medium size,** tapered to petiole, to 50 mm long & 1/5 as wide (rarely to 100 mm & 1/7 as wide)
  47c Calyx 3-6 mm long; sepals lanceolate, narrowed abruptly or tapered to long tip
  Basal leaves few; stem leafy
  Inflorescence short, 1-3 clusters
  ne OR PROCERUS var. *procerus*
  47c Calyx 1.5-3 mm long; sepals ovate with abrupt short tip
  Basal leaves many; stem bare-looking
  Plant to 35 cm tall
  Cascade Range PROCERUS var. *brachyanthus*
47b **Basal leaves short, broad,** narrowed abruptly to petiole, to 20 mm long & 1/2-1/3 as wide (sometimes vary to 30 mm & 1/4-1/5 as wide, near CA); upper leaves 1/5 as wide
Calyx 1.5-3 mm long; sepals diamond-shape, erose on upper edges
Plant 5-12 cm tall
Inflorescence short, usually one cluster
Staminode usually not bearded
Wallowa, Blue, Strawberry, Steens Mtns.
PROCERUS var. *formosus*

38 **Leaves very narrow,** linear; lower leaves crowded; **no basal leaves**
Inflorescence sometimes long, 2-7 clusters
  48 **Corolla pubescent, pink, blue-violet, or white,** 8-10 mm long, drooping
  Inflorescence pubescent
  Lower leaves to 70 mm long & 1/14 as wide
  Plant 25-70 cm tall
  foothills, Deschutes Co. (RARE) PECKII
  48 **Corolla glabrous, blue-purple,** 6-10 mm long
  Leaves arched, folded; lower leaves to 60 mm long & 1/10 as wide, crowded
  Plant 15-40 cm tall
  foothills e side of Cascade Range, from Deschutes Co. South
  CINICOLA



P. cinicola

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The author thanks Peter Zika, Dr. David Wagner, and the several other botanists without whose constructive criticism this key would not have reached its present form; also Kenneth Lodewick for advice, and Dee Strickler for an added taxon.

Conservation Strategies and Monitoring of Rare Plants On National Forests in Oregon

A. gormanii *field study site no. 3 looking southwest*

By JENNIFER DIMLING

Responsibility for rare plant populations on federal lands is a major challenge for National Forest botanists today. To assure population viability we must identify rare species, learn what we can about their habitat preferences, and try to figure out how management on federal lands can be tailored to their needs. Each Conservation Strategy is constructed to help us do this.

The first step in devising a Strategy is to determine who should be involved. The Regional Office has given National Forests responsibility for writing Conservation Strategies for all our rare (or sensitive) species. Forest botanists then use information from the Natural Heritage Database to determine if the species exists elsewhere on federal lands. An interagency working group is organized if the species occurs on federal lands managed by several agencies. One person has the honor of being writer for the group while the others are critics in the process outlined below. I will illustrate the process with a Strategy I edited. If you have comments, please let me know.

What is a Conservation Strategy?

Conservation Strategies are designed to help manage sensitive species and to evaluate their status. This information may be used by the United States Fish and Wildlife Service and the State of Oregon to list or delist candidate species. Although there is no standardized format, most Conservation Strategies contain several similar pieces: a summary of all known information, a monitoring strategy, and management objectives for the species.

The first section of each document contains a synopsis of all available information about the species. This include taxonomic information, morphological descriptions, distribution maps, habitat information, population dynamics and breeding systems, and potential threats due to anthropogenic and natural disturbances. This information is most commonly gathered through challenge cost-share agreements with The Nature Conservancy and the Plant Conservation Biology Program of the Oregon Department of Agriculture.

Management teams gather information from a number of sources. Literature searches locate research done on the species and identify specialists working on its taxonomic group. Searches in local herbaria lead to information on former distributions of species. Herbarium labels often indicate associated plant species and habitats. Field notes from botanists who have surveyed for the plant may be useful in determining where the species does and does not grow. Confirmed sightings are documented in a Region 6 sighting form format so that they may be included in the state wide Oregon Natural Heritage Database.

An excerpt from the Conservation Strategy for *Aster gormanii*, whose synopsis was written by Cheryl Ingersoll for a challenge cost-share project between the Mt. Hood National Forest and the Oregon Dept. of Agriculture, serves as a good example:

Plant Description

Aster gormanii is a member of the Asteraceae (Compositae) or aster family, and is placed in the section *Eucephalus*, which has been reviewed by Thompson (1977). Other closely allied species of the section *Eucephalus* are also endemic to the Pacific Northwest, including *Aster brickelloides*, *A. glaucescens*, *A. ledophyllus*, *A. paucicapitatus*, and *A. vialis*. Three (*A. gormanii*, *A. glaucescens*, and *A. vialis*) are highly restricted endemics in Oregon and Washington.

Technical descriptions of *Aster gormanii* are provided by Piper (1916), Hitchcock et al. (1955), Abrams (1960) and Peck (1961). Hitchcock et al. (1955) describe the species as:

> "Perennial from a short and stout to more slender and branched rhizome, 1-3 dm tall; herbage glandular; lowermost leaves reduced, others crowded, uniform, sessile, elliptic-oblong, entire, mostly 1.5-3 cm long, 3-10 mm wide; heads solitary or sometimes 2-4; involucre 7-11 mm high, the bracts well imbricate..."

Distribution

As of 1994, a total of 63 *Aster gormanii* populations have been reported: 22 of these are located within the Mt. Hood National Forest, 29 are located within the Willamette National Forest, 10 are located on the Salem District of the BLM, one on the Warm Springs Reservation and one on private land (see Table 1 for site listings of all populations according to the Natural Heritage Database).

The species is restricted to a narrow geographic range within the western Cascades and High Cascades physiographic provinces (Franklin and Dyrness 1973). The southernmost (Iron Mountain) and northernmost (South Fork Mountain) occur less than 50 air miles apart. The westernmost (Table Rock) and easternmost (Harvey Lake) localities are only 30 miles apart. Within this area, *Aster gormanii* is restricted to scattered open areas on ridge crests, mountain summits, and slopes between about 1200 and 1700 m. (3,900 and 5,500 ft.) elevations, with a single population at 1900 m. (6,200 ft.).

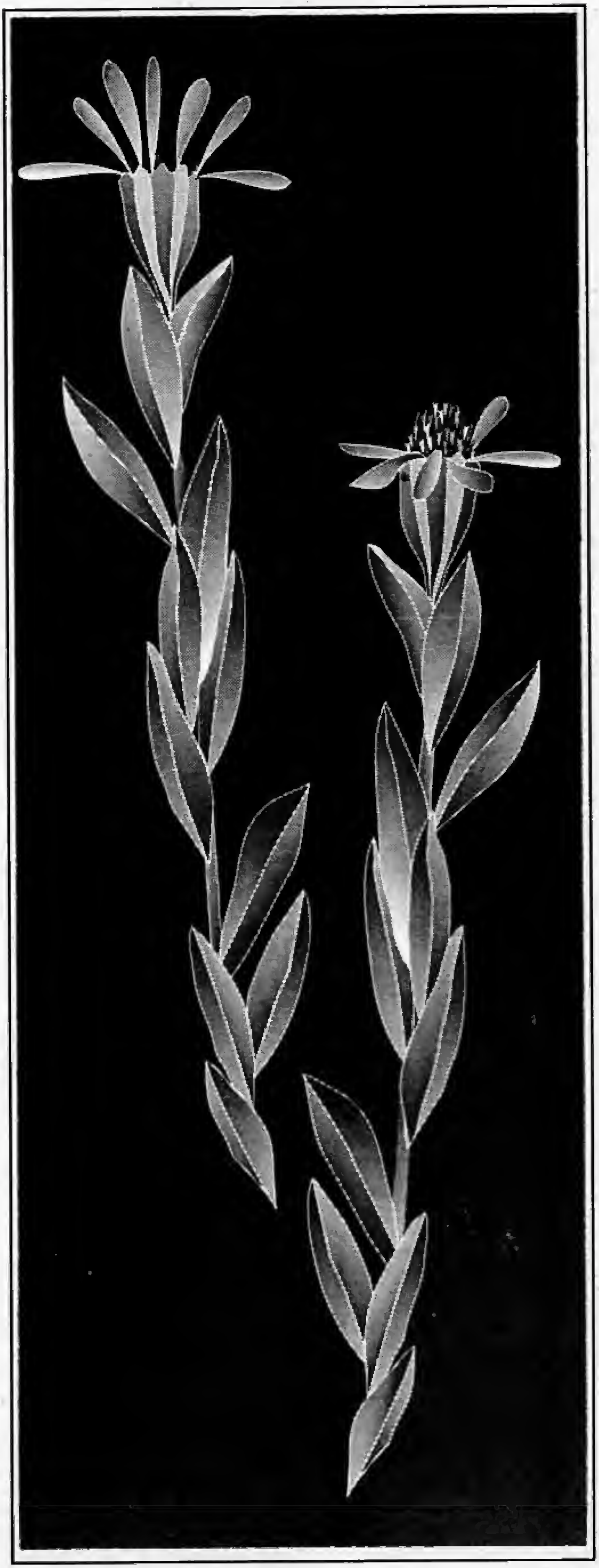
Habitat Description

Soils

Most *Aster gormanii* sites on the Mt. Hood National Forest are pyroclastic outcrops composed of tuffs and breccias (e.g. North Dickey Peak and Granite Peaks). *Aster gormanii* also occurs on basalt or andesite outcrops (South Fork Mountain and Baty Butte). Soils associated with both types of outcrops are generally quite shallow and very well drained.

Plant Communities and Associated Species

Aster gormanii occurs in forest openings in the *Abies amabilis* and lower portions of the *Tsuga mertensia* Zones (Franklin and Dyrness 1973). The species grows predominantly on south to east exposures of open ridge crests and steep slopes, but is found on west and north aspects as well. Occasionally it inhabits dry meadows and rock outcrop habitats.



Aster gormanii

Although A. *gormanii* can grow in partial shade, it is rarely found under closed canopy or dense shrub cover. Where it occurs, it is often a dominant member of the plant community.

Hickman (1976) lists *Aster gormanii* as a major component of the non-forested *Lotus nevadensis / Chrysothamnus nauseosus / Allium crenulatum* "Tuffaceous Gravel Association" in the central-western Cascades. His observations were based on the only three sites at which the species was then known to occur.

Population Dynamics

Virtually nothing is known about the population dynamics of *Aster gormanii*. As the species had been rarely seen until recent years, its biology has received little attention.

Aster gormanii is a long lived herbaceous perennial. It exhibits extensive rhizomatous growth, and individual plants may reach 1 m. in diameter and have well over 100 stems. Beily (1980) suggests that the species is a poor competitor, and this is supported by observations of its growth form and habit. Plants generally reach their largest size and greatest density of stems and flowering heads when growing in full sun away from other vegetation.

Why Monitor?

Botanists use this information to add a monitoring protocol tailored to the species. The protocol is designed to fill gaps in knowledge not covered by the literature and herbarium surveys. The interagency group writes goals and objectives for monitoring that include accepted error rates and probabilities so that monitoring designs will detect real changes in populations. Sometimes populations are small enough to count all the plants, but, in most cases, one must sample plants to estimate the entire population size. Two types of monitoring may be conducted: demographic and experimental.

Demographic monitoring lets you know how the species is doing. Selected populations (or all of them if there aren't many individuals) are followed for a number of years to determine if individual populations are increasing, decreasing, or stable.

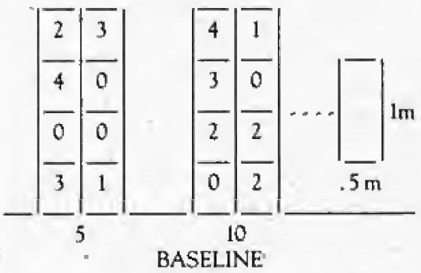
Plant monitoring

Demographic monitoring can be simple or complex, depending on the information needed, level of endangerment of the plant, time available and number of sites monitored. The simplest protocol counts the number of plants within each sample plot as a means of estimating stability in the population over time. A more complex Strategy is needed to discriminate between reproductive and vegetative individuals. Some studies also measure reproductive effort and attempt to correlate reproduction with environmental parameters such as temperature and precipitation. The most complex Strategies tag individuals and follow each plant through its life cycle. In addition to measuring reproductive output, this monitoring protocol enables the botanist to determine longevity of plants and whether changes in population numbers are due to death or recruitment.

Monitoring Protocol

Dr. Susan Kephart, Willamette University, designed a management protocol for *Aster gormanii* for the Salem District BLM. Our interagency group has adopted most of the original design. We count plant stems rather than individual plants of this rhizomatous species. When we count stems, their reproductive status (vegetative, flowering, or fruiting) is noted. We map clumps of aster within the plot so we can tell (a) if the clumps are growing or contracting, and (b) if new plants come into the plot.

The guidelines outlined by Dr. Kephart are designed to: (a) assess natural variation in population numbers through estimates of cover for *Aster gormanii* and co-occurring plants; (b) assess overall plant fitness through measurements of stem height and flower head diameter in three randomly chosen plants per plot; (c) assess fecundity through counts of flowers and fruits and through counts of seedlings.



DATA SHEET

m5	m10	m15
2.3	4.1	3.5
4.0	3.0	0.0
0.0	2.2	3.1
3.1	0.2	4.2

To get an idea of variability of plants across the habitat, use a half meter on either side of the perpendicular transect to create two sides of a plot. The other two sides of a plot are two meter lengths as measured along your perpendicular tape. For each meter along the perpendicular tape, take two readings, number of plants per plot on either side of the tape. Take plot data until you come to the edge of the habitat.

Population Monitoring

Population monitoring sites will consist of three populations on the Willamette NF, Bachelor Mountain, Marten Butte, Phantom Natural Bridge, and Pika on the Mt. Hood NF.

Table 1

Monitoring Sites

Monitor Site Name / No.	District Forest/Agency	Threat / Disturbance	Elevation (feet)	Habitat	Schedule
Granite Peak clearcut EO 022	Clackamas Mt. Hood NF	Timber sale Cut through middle of population	5,200	Open ridgeline (lithosol)	historic continue
Pika TS EO 008	Estacada Mt. Hood NF	Timber sale buffer 25-50 ft.	4,200	rock outcrop (lithosol)	historic continue
South Fork Mountain EO 028	Estacada Mt. Hood NF	Clearcut early 1970s Archeological site	4,300	rock outcrop XETE, ABAM, ABPR (forest edge)	initiate 1994
Bull of the Woods EO 014	Estacada Mt. Hood NF	Lookout Trail with human and horse use. Subpop. in burn Subpop. along trail	5,000	rock outcrop (lithosol)	initiate 1994
Baty Butte site no. 1 EO 006	Salem BLM	Timber sale Adjacent road/quarry Seedling recruitment monitoring	4,800	rock outcrop (lithosol)	initiate new plots 1994
Bachelor Mtn. EO 016	Detroit Willamette NF	Fire in the late 1960s Adjacent A. *ledophyllus*	5,500	scree (lithosol)	initiate 1994
Marten Butte EO 059	Detroit Wilamette NF	Scattered clumpy unhealthy pop? Adj. timber sale buffer	4,400	on banks of dry ravine (lithosol)	initiate 1994
Phantom Natural Bridge EO 051	Detroit Willamette NF	Trail, Adj. plantation	4,280	moss (lithosol)	initiate 1994

Plots will be read yearly for five years. After five years, plots will be read every other year and the results compared to the range of values (natural variation) obtained in years one to five. If there is a 30% decrease in the number of individuals or in the reproductive rate (with an 80% confidence level and sampling error rate of 0.05), there is a need for active management. If there is a need for active management, we will find out whether *Aster* responds positively or negatively to any of the management disturbance regimes we routinely produce through disturbance monitoring. If natural or human disturbance, as in pre-commercial thinning, would not be effective in increasing populations, perhaps habitat enhancement, such as prescribed fire or tree/brush cutting, would be necessary to improve populations in trouble.

Experimental monitoring is used to determine effects of both anthropogenic and natural disturbances on populations. We need to know whether plants will survive management actions, or if they need some type of disturbance for survival. This information is critical for designing management strategies for each sensitive species.

Experimental monitoring can be prescribed where management actions are proposed (a timber sale or a grazing allotment) where sensitive species occur. In such cases, an experiment is set up where the results of treatments are statistically analyzed against non-treatments (controls). For example, if one wished to know the effect of timber harvest on a species, one might sample some part of the plant population exposed to harvest and another buffered from harvest. Similar experiments are conducted to study the impact of trail construction, or prescribed burning. Monitoring is planned in conjunction with a statistician who aids in experimental and statistical analysis. Replication of treatments and number of plots naturally vary between experimental sites. Experimental monitoring is primarily used to infer responses of other populations of the species to similar treatments. Disturbance monitoring for *Aster gormanii* illustrates why the help of statisticians is vital to obtaining results from monitoring.

Disturbance Monitoring

Disturbance monitoring determines how populations react to active management regimes. There is some evidence that *Aster gormanii* can reestablish individuals within a quarried site (Baty Butte) and survive disturbances associated with timber harvest (Granite Peak and South Fork). Lack of information on pre-disturbance population numbers or the extent of direct disturbance makes it difficult to evaluate the response of *Aster gormanii* to these disturbances.

Most monitoring projects initiated prior to this Conservation Strategy (Granite Peak, South Fork) determined pre-disturbance population sizes. These sites will continue to use the methods that were set up when the monitoring was initiated. New monitoring sites, including one site which has been disturbed by recreational activities (Bull of the Woods) and one which has been quarried (Baty Butte), will follow the protocol of this Strategy. New monitoring plots will be read before disturbance (if possible) and after one, three and five years to determine whether there are any long-term adverse effects due to the disturbance.

SSW of A. gormanii *study site no. 3 near Baty Butte*

Evaluating effects of disturbance using information gathered from monitoring plants set up prior to this Conservation Strategy could be difficult because of the lack of control plots. Control plots would have allowed comparison of population trends influenced by environmental factors. For example, if there were a sharp decline in plant numbers in the disturbed population, but not in the control, the decline could be due to the disturbance. Without controls, it may be difficult to separate normal fluctuations from change due to disturbances.

What Do We Do With All That Data?

Once all available information is examined, the management team responsible for the species may develop an initial Strategy for the species (usually quite protective, especially when little is known about the species response to management). Management plans often contain specific goals and objectives for the species. One goal common to all Conservation Strategies is the maintenance of at least viable populations of the species throughout their range. Management objectives may recommend that certain populations remain unmanaged and that others be used for experimental monitoring purposes. Or management objectives may apply to the species as a whole. For example, all populations should be buffered 500 feet from activities liable to affect the plant; or management will occur on a site-by-site basis with reasoning clearly stated in the environmental document.

A management plan with clearly defined objectives is outlined for *Aster gormanii*. Recommendations for the most common management activities likely to affect populations are noted:

Objective

The objective of *Aster gormanii* management is to maintain healthy, reproducing populations of the species at a variety of sites within its range. In order to accomplish this objective the following steps are recommended:

1. Protect populations from immediate threats to their existence;
2. Evaluate population responses to site disturbance in areas where planned projects or heavily used trails are adjacent to large populations;
3. Continue species inventory, particularly in areas that are protected from development;
4. Collect additional baseline data on habitat requirements and community characteristics; and
5. Monitor demographic trends in populations on sites representing a range of environmental conditions throughout the range of the species.

Management of Populations

Management strategies for each population will be designed on a site specific basis by the resident botanist. In most cases, timber harvest directly adjacent to the population is discouraged. However, selective harvest, meant to thwart encroachment of trees on the population, habitat improvement, could occur. Road building and quarrying adjacent to the population is also discouraged.

Agencies included in the Conservation Strategy often schedule a meeting to ensure information exchange on a regular basis. The Conservation Strategy document is not meant to be static, but fluid. If problems arise during monitoring, the group discusses it and the plan is amended. Monitoring results are discussed and the group may change the management strategy based on new information about the species' response to disturbance or to management activities. If populations are in decline and some type of habitat enhancement regime seems necessary, then recommendations will be made to managers.

How Can NPSO Members Help?

Native Plant Society members can help USFS botanists in a number of ways. Get your chapter to coordinate with agency botanists to help with monitoring. You will learn about sensitive species in your area and the botanists will have help doing their monitoring. Or you could volunteer to visit populations that haven't been seen in a long time to determine whether they still exist. If you are more comfortable in the library, you could volunteer to do literature searches. Herbarium work is often time consuming and this information is always needed. If you know about computers, you could help write and edit a Conservation Strategy. If you are just interested in final products or specific plants, get in touch with your local Forest botanist and let him or her know you are interested.

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Cimicifuga elata — Tall Bugbane

By THOMAS KAYE

This year's featured plant is a rare species that has attracted the attention of botanists concerned with its survival in western forests. Tall Bugbane *(Cimicifuga elata)*, a member of the buttercup family *(Ranunculaceae)*, occurs from the lower Fraser Valley in British Columbia, through western Washington, to southern Oregon. It is an herbaceous perennial usually four to six feet tall with compound leaves and spray-like clusters of white flowers. The flowers themselves do not have any petals, but instead are made showy by an abundance of white stamens. The species has special management status with the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM), and it is a candidate for listing as threatened or endangered with the state of Oregon.

Tall bugbane is unusual compared to most rare plants. Typically, rare species have populations composed of hundreds or thousands of individuals, but populations are restricted to a small geographic area. Tall bugbane, in contrast, usually has small populations (over half contain fewer than 25 plants) and it occurs over a large range. Oddly, though, in the southern part of the species' distribution its populations are almost always very large, with plants numbering in the thousands. There is no confirmed explanation for this peculiar pattern, but some hypotheses have been proposed. For example, more extensive optimum habitat may be available in southern Oregon, and/or populations in this area may be evolutionarily and taxonomically divergent.

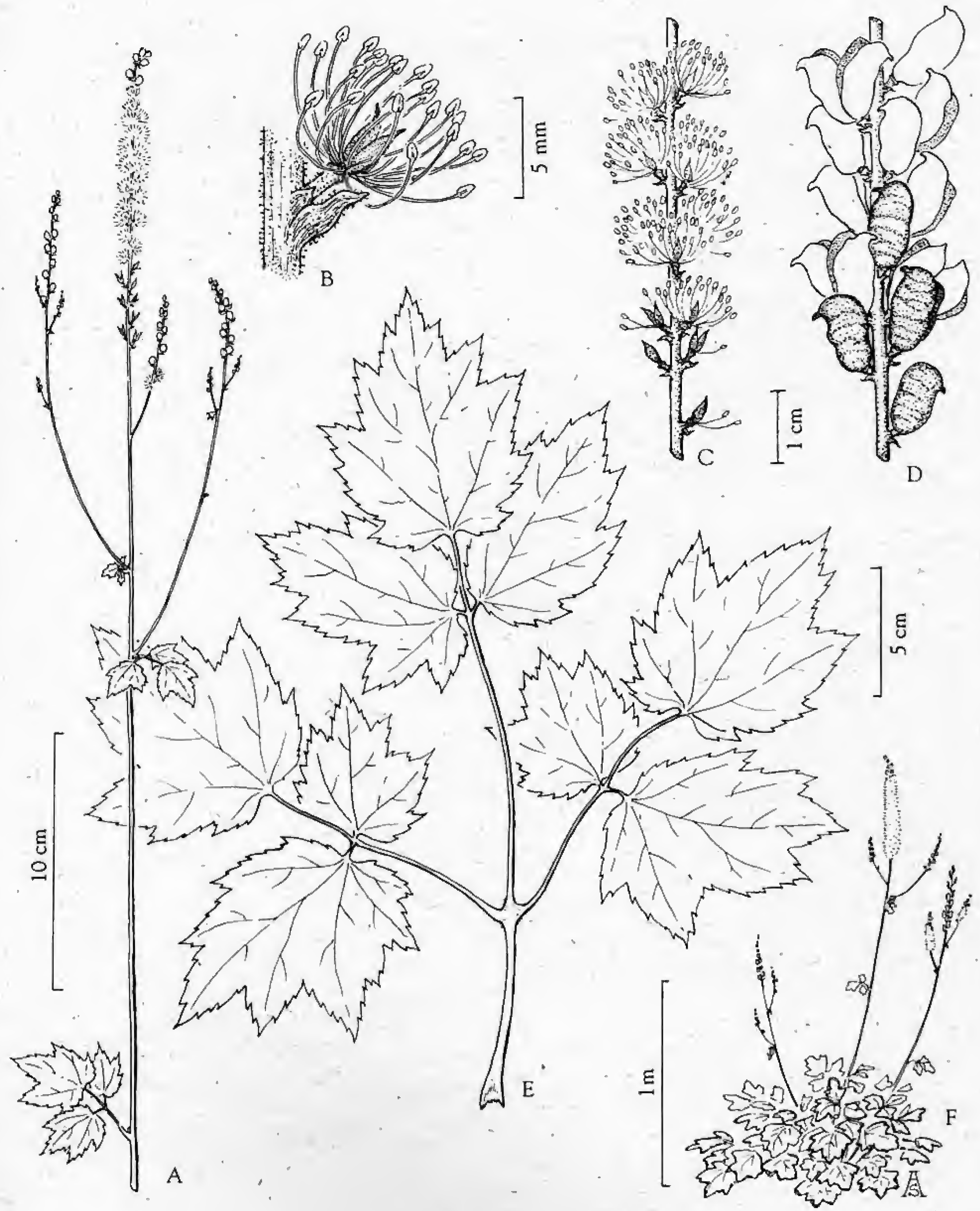
Tall bugbane is one of fifteen *Cimicifuga* species in the world. All are north-temperate and six occur in North America. One other species in the genus, Mt. Hood bugbane *(C. laciniata)*, occurs in Oregon in the vicinity of its lofty namesake. In ***Flora of the Pacific Northwest***, Hitchcock and Cronquist explain that the genus name *Cimicifuga* comes from the latin *cimex* (bug) and *fugere* (to repel), because at least one species can be used to repel bed-bugs! The entire genus is well known for its medicinal properties, especially as an anti-inflammatory, anti-spasmodic, sedative, and soother of menstrual cramps. The medicinal potential of these plants underscores the practical need for conservation and protection of tall bugbane.

The presence of tall bugbane in west-side forests creates the potential for conflict with timber harvests, so federal and state agencies collaborated recently to evaluate the species' current status, habitat requirements, and response to logging. According to Natural Heritage Program database records, there are about 100 populations in Oregon and 30 in Washington. Field research indicates that the species almost always occurs under a patch of deciduous trees (such as big-leaf maple) in an otherwise coniferous forest (usually dominated by Douglas fir, western hemlock, and western red cedar). In addition, the species prefers north-facing slopes and some source of moisture, either in the form of a nearby stream or subsurface flow. Beyond these commonalities, however, the plant communities in which bugbane populations occur differ significantly from one region to another, such as the Columbia Gorge, central Cascades, and southern Oregon. Descriptions of regional habitat-types for tall bugbane have already improved the efficiency and success of searches for the species.

Conventional wisdom holds that tall bugbane should be negatively affected by timber harvest because it typically occurs in old-growth forest. However, analysis of populations in several different types of managed and unmanaged forests shows clearly that plants in clearcuts and thinned stands are taller and have more flowers than in uncut forests or old second growth (greater than 70 years). In addition, recruitment (birth) and growth of new individuals is greater in clearcut and thinned stands. Some timber harvest is probably compatible with tall bugbane conservation, but we do not advocate clearcuts as a means to improve conditions for the species. This is primarily because we have no information on what happens to populations 15-30 years after timber harvest, when some young forests are so dense that light levels are even lower than in old-growth forests. Instead, conservation of tall bugbane should rely on protection of some populations combined with careful manipulation of the forest habitat of others, such as thinning and prescribed fire. The short-term (or longer) tolerance of bugbane populations to forest disturbance coupled with the relatively large number of reported populations is encouraging, and will allow conservation efforts to be flexible and creative.

The wide distribution of tall bugbane in Oregon makes it fairly accessible to interested NPSO members. Populations are best viewed in June and July when plants are in bloom. If you live in southern Oregon, the easiest population to visit is at Grizzly Peak east of Ashland. In the Willamette Valley, try the "New Growth Trail" in Oregon State University's McDonald Forest.

Additional information on tall bugbane research by botanists from the Oregon Department of Agriculture, USFS, and BLM is available from the author in a technical report entitled, "*Cimicifuga elata:* Status, Habitat Analysis, Monitoring, Inventory, and Effects of Timber Management."



Cimicifuga elata. A) scape; B) close-up of flower; C) part of the raceme showing flowers and developing follicles; D) mature follicles; E) basal leaf; F) habit.

The botanical illustrator, **Andy Sudkamp,** *lives in Grants Pass.*

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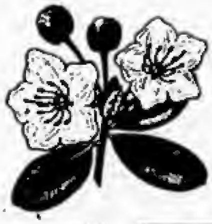

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